



TH230/TH230+ POS Printer

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With kind regards,
Wincor Nixdorf International GmbH
SAT22
Wohlrabedamm 31
D-13629 Berlin

Your opinion:



TH230/TH230+

POS Printer

Programmers Guide

July 2013

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Overview

Purpose of this document

This Programmers Guide describes the properties of the controller for the high speed ESC-POS thermal printer TH230/TH230+.

Introduction

The TH230 and the TH230+ are powerful and low cost thermal printers for all kind of POS systems.

In this manual both printers will be referred to as **TH230**. Only in case of essential differences there will be a distinction between TH230 and TH230+.



General Characteristics of the Printer

- High speed ESC-POS thermal printer
- Interface Board Changeable
- Different Host Interfaces: RS232, USB, PoweredUSB and others
- Printer is able to operate in horizontal and vertical position
- Paper width: 80 mm or 57.5 mm
- Diameter of Paper rolls: up to 90 mm
- High Print speed: up to 220 mm/s (110 mm/s with two color paper)
- Thermal print line: 80mm width, 640 Dots, 203 dpi (0.125 mm) resolution
- Print width 72 mm centered on 80 mm paper width
- Different Codepages and loadable Character Sets
- Bar Code printing
- Paper feed with Stepper motor, vertical resolution: 203 dpi (0.125 mm)
- Fast Cutter with Stepper motor and Home Sensor (cutting time is 300 ms)
- Automatic Reverse Feeding after Cut to reduce Top Margin to 5 mm.

Sensors for Cover Open, Paper Near End, Paper End

- Optional Mark Sensor usable for 80 mm paper on different positions
- Parameter setting with configuration menu
- Self test and Statistic Functions
- Adjustable Power Consumption from 48 W to 110 W
- Automatic Power Detection for Wincor-Nixdorf Power Supplies

Firmware Characteristics of the Controller

The **TH230** printer is controlled with the aid of control sequences, i.e. a series of characters. The standard setting is thus overridden, which means that you are able to set many print functions individually if the standard values do not correspond to your requirements. Possible changes are, among others, the selection of different line feed sizes and the printing of various graphics. You will see that it is very simple to control the printer according to your own personal requirements. However, a precondition for proper use is the correct installation and/or configuration of the system. In addition, you should be familiar with the operating system of your computer.

With the interfaces USB 1.1 (USB 2.0 compliant) or RS232, all the status information's can be called up using the different control commands. Via this interface, it is possible to synchronize the user software and the printing properties. The TH230 printer supports an **ESC POSTM** command set.

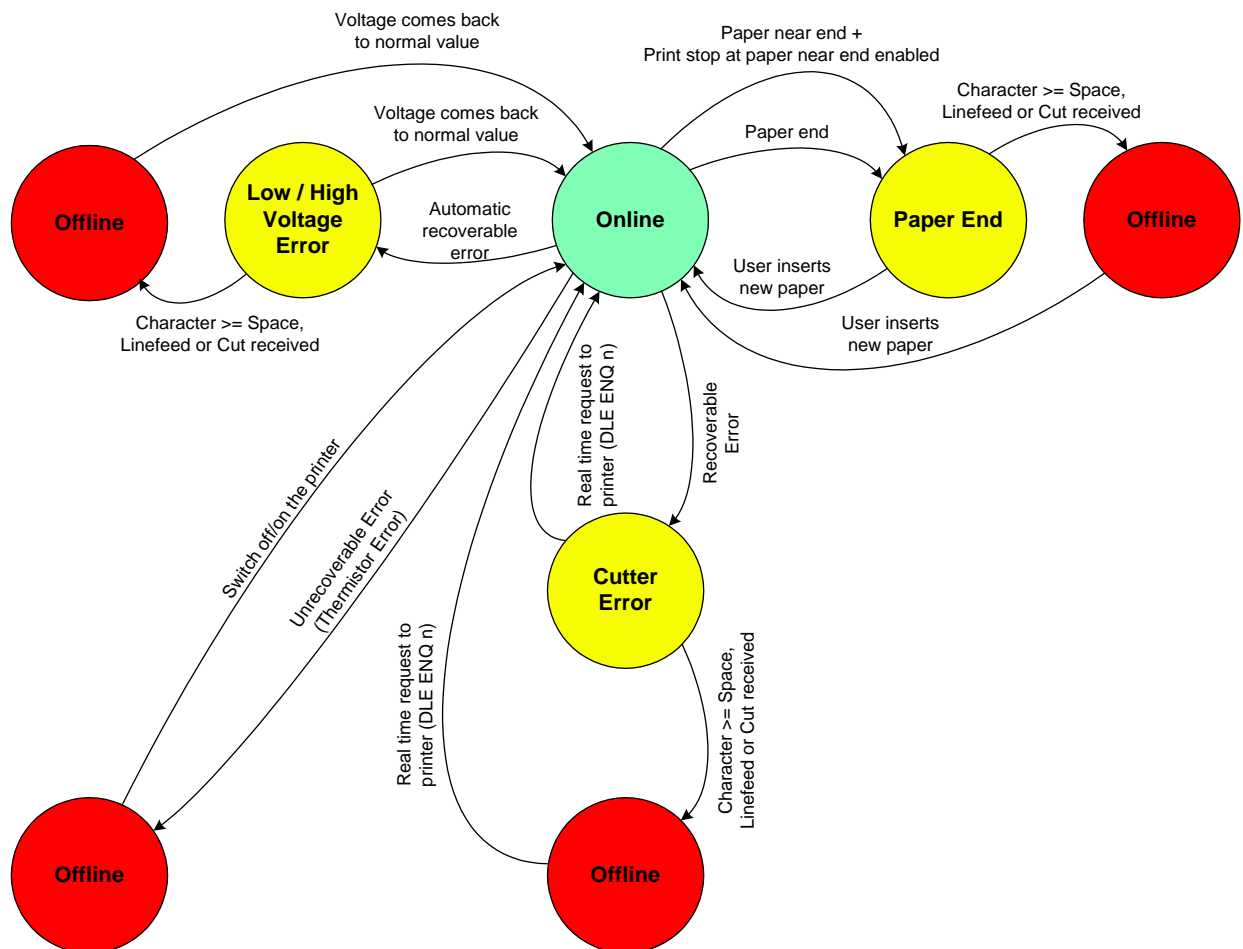
Line feed

The line feeds of the **TH230** printer are initiated by the control commands **LF** and **ESC d**. The line spacing between 2 lines can be set by the control command **ESC 3**. The default value after reset or power on is 3.37 mm, which equals 27 micro steps. One micro step equals one dot distance of 1/203".

Offline State

If the **TH230** printer leaving the online state, nevertheless it responds to all real time commands and real time status commands. Sending other data than real time commands may lead to data loss (see memory switch 2-8 Listen to Real-Time-Commands).

Online / Offline State Diagram



Remark: If the printer enters Offline State the Busy bit is set (see commands DLE EOT, GS ENQ and GS a).

Operator Panel

The Operator Panel consists of one button and three LED's. In addition there is one power button to switch the printer on and off. In the following description, you can see which function of the printer influence the LED's and which functions are executed with the buttons:

Linefeed Button

If you push this button once and release it, the printer executes a small paper feed. If you push this button and hold it down, the printer feeds the paper as long as the button isn't released.

This button is also used in the self-test printing see chapter Print Service Menu on page 246.

Power LED Green

Off: Power is not stable.
On: Power is stable.
Blinking: The maximum power setting is auto and no Wincor Nixdorf power supply is used. The maximum power setting can be changed by the command GS (E fn=5 (see page 105). The user has to set a fix maximum power setting according to the used power supply.

This LED is also used in the Diagnostic mode (see page 246).

Paper End LED Yellow

Off: Paper is loaded (Normal condition).
On: Printer detects paper roll end or paper roll near end.

This LED is also used in the Diagnostic mode (see page 246).

Error LED Red

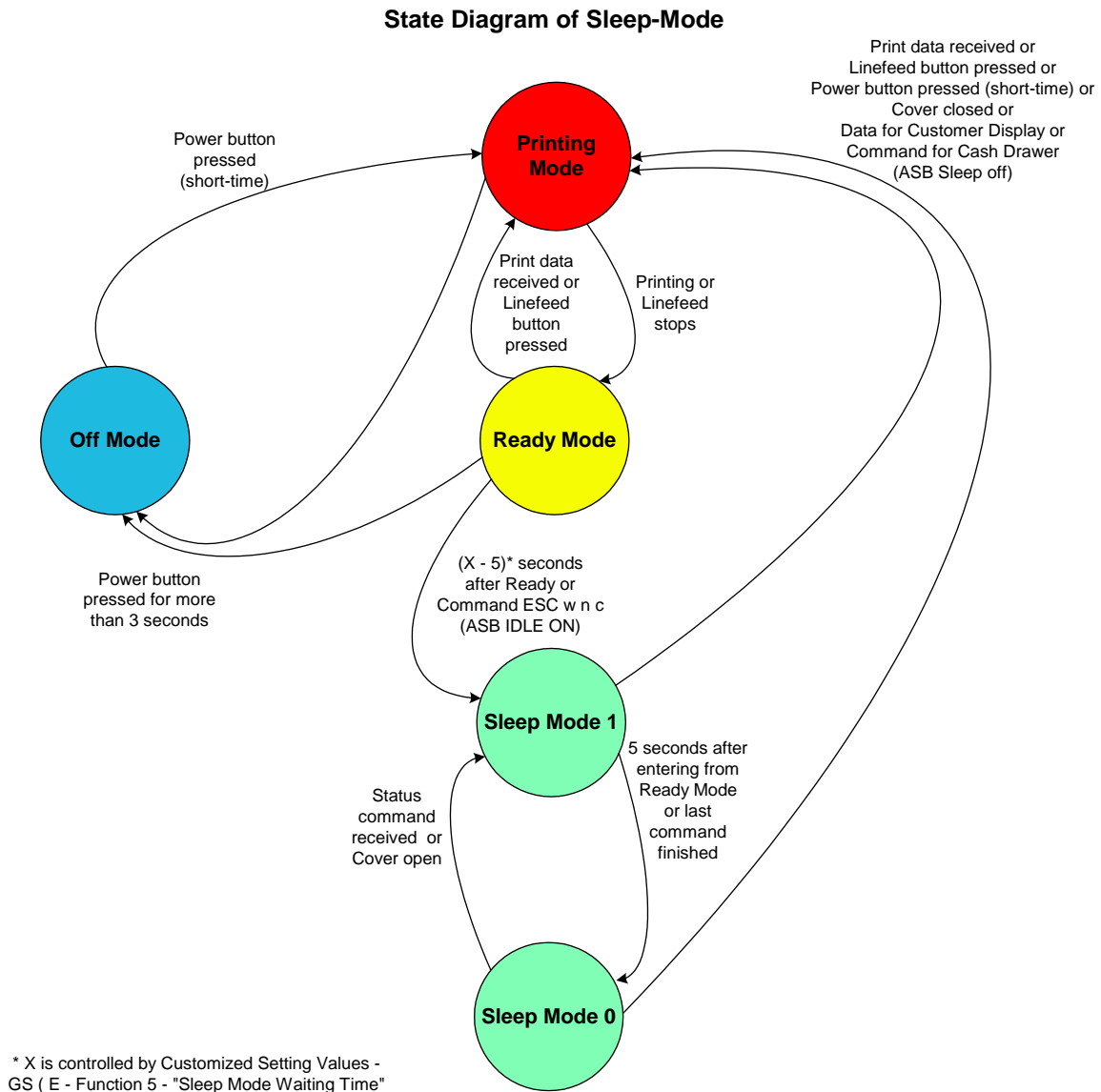
Off: Normal Condition.
On: Offline.
Blinking: Error.

This LED is also used in the Diagnostic mode. For an exact description of this LED see page 246 and page 287.

Sleep Mode

The Sleep Mode is used to save energy when the printer is switched on but has nothing to print. This mode reduces the Total Cost of Ownership (TCO). Sleep Mode is switched on by a Memory Switch. The Sleep Mode Waiting Time is set by a Customized Setting Value and defines the time; the printer has to wait before it changes into Sleep Mode.

In the following state diagram the coherence between the different modes is described.



In previous models and firmware versions Sleep was called Idle and Ready was called Standby. The terms are changed because of adaption on ENERGY STAR® nomenclature.

The current consumptions depend on different modes and the installed interface. Find details in chapter "Technical Specifications", page 282.

Diagram of Power States TH230 / TH230+

The following diagram is valid for TH230 and TH230+ and not for iPRINT.
There are different ways, to switch the Printer ON or OFF:

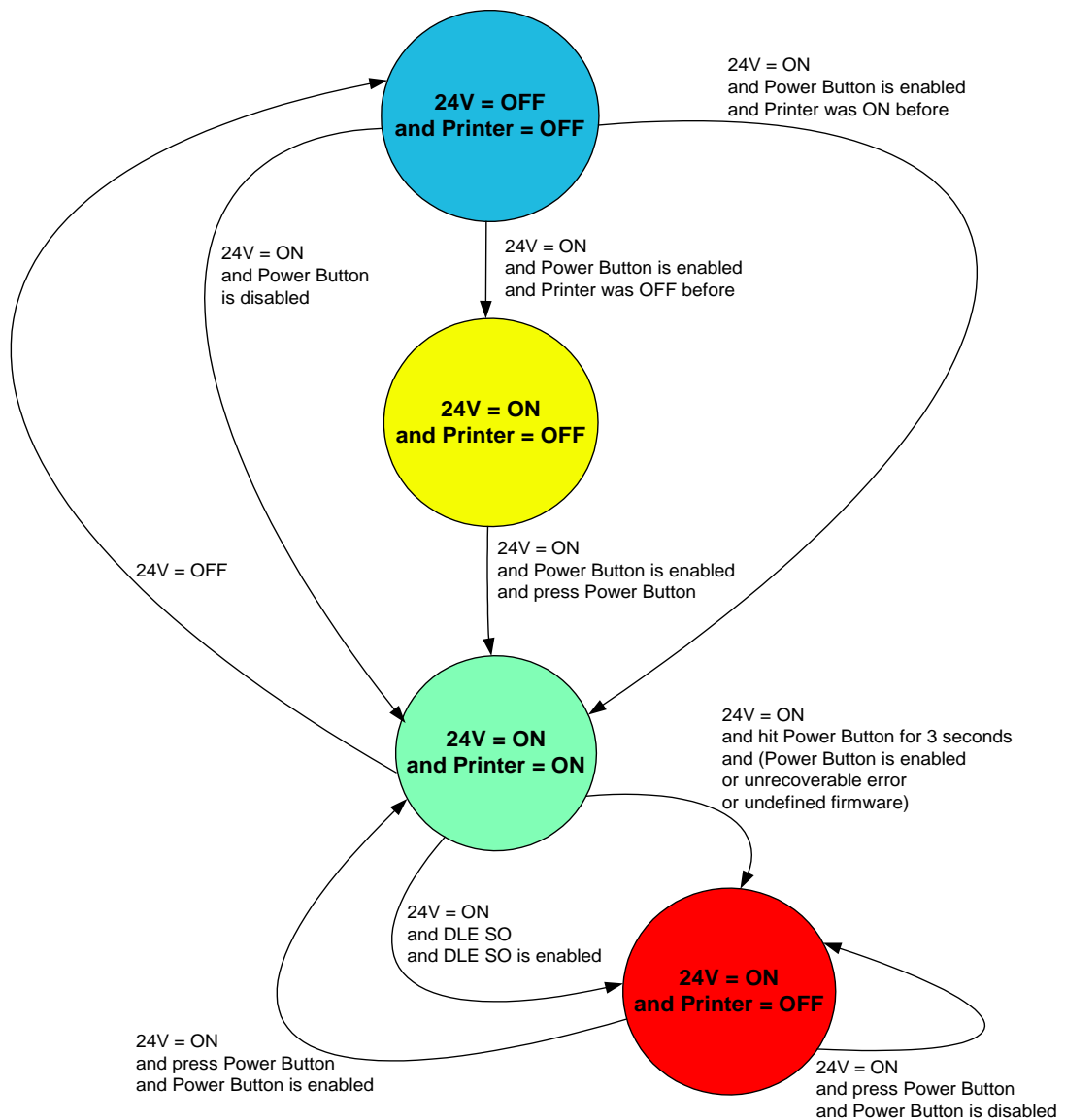


Fig.: Power ON and Power OFF

You will find additional information about “Power off control by host” on page 9.

Programming Hints

In this chapter programmers may find some hints and tricks to make the thermal printout faster, look better or increase the lifetime of the thermal print head.

Vertical Dot Lines

| | |
|------|--|
| Text | <p>To increase the lifetime of the thermal print head the programmer has to avoid printing of long vertical dot lines like in the ticket on the left side. In this ticket the two vertical dot lines are printed always with the same two print dots of the thermal print line. This leads to a big mechanical wear and thermal wear for this two dots. To avoid early failure of the dots, vertical lines can be printed as dotted lines instead of solid lines. Another possibility is to move the printout from ticket to ticket horizontally by one dot. This can be done for example 10 times. After this the printout starts from the beginning. Thus the lifetime is much higher compared to print always on the same position.</p> |
|------|--|

Horizontal Dot Lines

| | |
|------|--|
| Text | <p>To increase the performance of the printer the programmer has to avoid printing of long horizontal dot lines like in the ticket on the left side. If the printer has to print such lines the current to heat the print line is very high. For this reason the printer moves the paper slower and the performance was decreased. To avoid bad performance, horizontal lines can be printed as dotted lines instead of solid lines.</p> |
|------|--|

Reverse Feed after Cutting

To avoid paper bending the programmer should not use cuts with backward feeding of the paper (command GS V(m=67)).

Small Graphics Printing

If the printed graphics does not reach until the right border of the print area, the programmer should transmit only this part of the graphics in which printed dots are available. It is not necessary to transmit the null byte on the right side of the graphics and this leads to a bad print performance.

Power off control by the host

The following is an example of the printer power off process when the printer is turned off using DLE SO (fn = 2) command.

- 1) Transmits the following continuous procedure before the system is turned off.
 - Execute the last print command such as LF, ESC d, etc.
 - Execute GS (D pL pH m a b (pL=3, m = pH =0, m =20, a =2, b =1)
 - Execute GS r n (n =1)
- 2) Waits for the paper sensor status from the printer by the GS r n command.
- 3) Transmits DLE SO n a b (n =2, a =1, b =8)
- 4) Waits for the power off status
 - The power off status is transmitted by the power-off sequence within 10 seconds after transmitting DLE SO n a b.
 - If the power off status is not checked, waits for 10 seconds or more after transmitting DLE SO (fn = 2).
 - For the serial interface model, the printer status is transmitted regardless of the condition of the host.

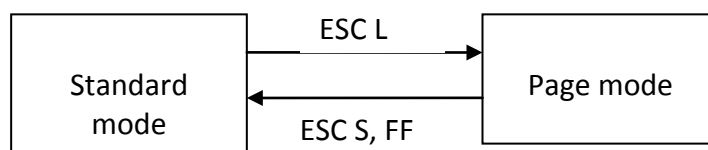
The behavior of the Power Button is described on page 7.

Page Mode Tips

The thermal printer TH230 supports two different print modes: standard mode and page mode. The standard mode is supported by all banking printers and in this mode, the printers print data in the print buffer by executing the print commands (such as LF, CR, and ESC J) or when the buffer is full. The standard mode is the print mode which prints data one line at a time.

The page mode executes batch printing with FF

or ESC FF for all data in the print buffer stored after the page mode is selected with ESC L. In this mode, the print commands other than FF or ESC FF, such as LF, CR, or ESC J, only move the printing position and do not execute actual printing. Executing ESC S or FF returns to standard mode. The page mode is the print mode which prints data one page at a time. The page mode print data can be deleted by CAN. There are generally four possible print directions in page mode which can be adjusted by ESC T.



Basic processing procedure for the page mode:

1. Select the page mode with ESC L (standard mode is changed to page mode).
2. Set the position and size for the printing area with ESC W.
3. Select the starting position and the direction for data development with ESC T.
4. Store print data (such as characters or graphics) in the print buffer.
5. Print all data in the print buffer collectively with ESC FF.
6. Return to standard mode with ESC S. (You can skip procedure 6 if you use FF instead of ESC FF in procedure 5.)

Characteristics of the page mode

The flexible layout enables you to execute printing which you cannot accomplish in the standard mode.

- Downloaded graphics, bit images or bar codes can be printed on the same line with other data including characters at the same time.
- Characters and bit images can be rotated (90° clockwise, 180° clockwise (upside down), or 90° counterclockwise).

Copy printing is possible.

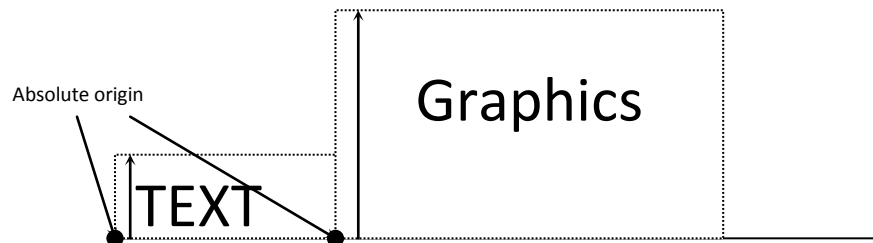
- Because printing with ESC FF enables storing of data in the print buffer, executing ESC FF repeatedly results in the same printing. It is also possible to print repeated data with changes in some parts.

The printable area can be changed several times by ESC W. Nevertheless, the whole page will be printed.

Absolute Origin of Graphics and Text in Page Mode

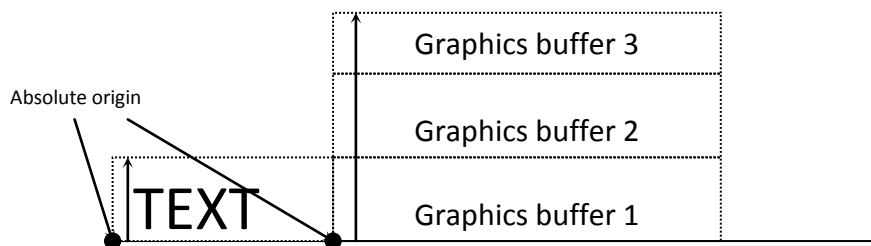
The printing area is set by the command ESC W (see page 63). The absolute origin of graphics and text is the lower left of the printable area. This caused a different behavior:

- ✚ Text and graphics (for example GS *, ESC (+*.BMP file) and GS (L) can be printed in the same row
- ✚ Print buffer will be print form bottom to top.



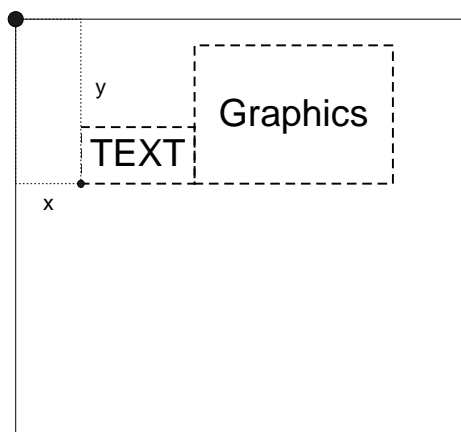
Caution:

- ✚ A graphics will be print with a count of print buffer

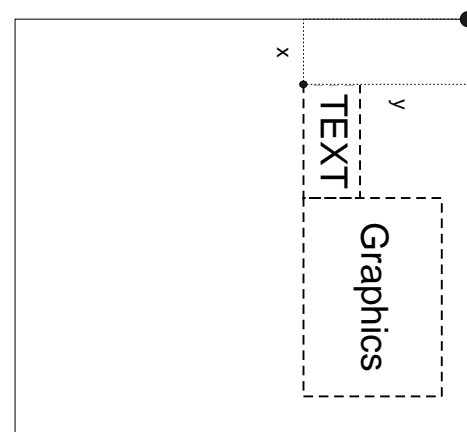


- ✚ If no space to the upper edge for printing the graphics completely, the upper part of the graphics will be cut.
- ✚ If the print position in page on the upper edge (depend on print direction (ESC T)), the print position will be set down with the height of the print buffer. Graphics which are built with more than one buffer will be cut.
- ✚ For printing graphics in page, take care for the space to the upper edge and to upper print lines! If is the space to low, set with GS \$ or GS \ the print position to a better point.
- ✚ The absolute origin for positioning the print buffer depends on the print direction (set with ESC T).

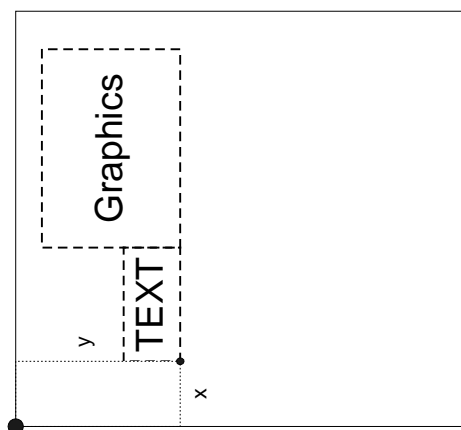
Positioning with Left to Right printing



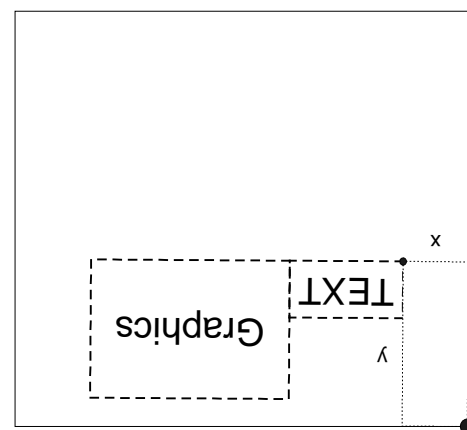
Positioning with Top to Bottom printing



Positioning with Bottom to Top printing



Positioning with Right to Left printing



Barcode

Barcode can be used in Pagemode with limitations. Barcodes can only be print at start of line, that's why horizontal position commands do not work with barcode. For positioning barcodes, ESC W is useable.

Control Sequences

Control Characters and Control Sequences

The valid control characters are located in the code area below 20H. These are the characters LF, FF, GS, DLE and ESC. All other control characters are not valid, and are ignored by the controller.

The valid control characters (with the exception of ESC, GS and DLE) are single character control commands, and directly start control functions.

ESC, GS and DLE are always the start of a multi-character control command, which consists of a different number of characters after ESC, GS and DLE. They only perform the requested command if the complete character string is valid. The whole control string will be ignored if a wrong (not valid) character is found in the string. The next character is then interpreted as the start of a new command.

Notation of the Command Description

| XXXX | Command Character or Command Sequence |
|---------------------|--|
| Function: | Name of the command |
| Code: | Code Sequence (Notation) Hexadecimal = 0x.. Decimal = .. Binary = <.....>B ASCII = "..." Repeat bracket contents = [] k Format |
| Range: | Describes the permitted range of values. |
| Description: | Describes the function of the command. |
| Notes: | Provides important information on settings. |
| Default: | Describes the standard values. |
| Example: | Examples of the command in use. |
| Reference: | Reference to other commands. |

Command Overview

| Code | Function | Page |
|--------------------------|--|-----------|
| HT | Horizontal tab | 23 |
| LF | Print and line feed | 23 |
| FF | (1) Print and return to standard mode (in page mode) | 24 |
| FF | (2) Print and feed marked paper to print starting position | 24 |
| CR | Print and carriage return | 25 |
| DLE | Clear printer | 25 |
| DLE EOT | Real time status transmission | 26 |
| DLE ENQ | Real time request to printer | 29 |
| DLE SO (fn = 2) | Turn off the power | 30 |
| DC1 | Print raster monochrome graphics | 31 |
| DC2 | Select Double-Wide Characters | 31 |
| DC3 | Select Single-Wide Characters | 32 |
| DC4 | Feed n Print Lines | 32 |
| NAK | Feed n Dot Rows | 32 |
| SYN | Add n Extra Dot Rows | 33 |
| ETB | Print | 33 |
| CAN | Cancel print data in page mode | 34 |
| EM | Full cut | 34 |
| SUB | Partial cut | 34 |
| ESC (+*.BMP file) | Download BMP logo | 35 |
| ESC BEL | Generate tone | 36 |
| ESC FF | Print data in page mode | 36 |
| ESC DC2 | Select 90 Degree Counter-Clockwise Rotated Print | 36 |
| ESC DC4 | Set Column | 37 |
| ESC SYN | Select Pitch (Column Width) | 37 |
| ESC SP | Set right-side character spacing | 38 |
| ESC ! | Select print mode(s) | 39 |
| ESC \$ | Set absolute print position | 40 |
| ESC % | Select/cancel user-defined character set | 41 |
| ESC & | Define user-defined characters | 41 |
| ESC ' | Write to User Data Storage | 43 |
| ESC * | Select bit-image mode | 44 |
| ESC * 1 | Select bit-image mode - Line Graphics | 46 |
| ESC * b m | Turn on/off TIFF compression | 47 |
| ESC - | Turn underline mode on/off | 48 |
| ESC . | Print Advanced Raster Graphics | 49 |
| ESC 2 | Set line spacing to 1/6 inch | 49 |
| ESC 3 | Set line spacing | 50 |
| ESC 4 | Read from User Data Storage | 51 |
| ESC : | Copy Character Set from ROM to RAM | 51 |
| ESC = | Select peripheral device | 52 |

| | | |
|--------------------------------|--|-----------|
| ESC ? | Cancel user-defined characters | 53 |
| ESC @ | Initialize printer | 54 |
| ESC D | Set horizontal tab positions | 55 |
| ESC E | Turn emphasized mode on/off | 56 |
| ESC G | Turn double-strike mode on/off | 56 |
| ESC I | Turn italic print mode on/off | 57 |
| ESC J | Print and feed paper | 57 |
| ESC K | Select Single-Density Graphics | 58 |
| ESC L | Select page mode | 59 |
| ESC R | Select an international character set | 59 |
| ESC S | Select standard mode | 60 |
| ESC T | Select print direction in page mode | 61 |
| ESC V | Turn 90° clockwise rotation mode on/off | 62 |
| ESC W | Set printing area in page mode | 63 |
| ESC Y | Select Double-Density Graphics | 64 |
| ESC [! t | Set control point | 65 |
| ESC \ | Set relative print position | 66 |
| ESC a | Select justification | 67 |
| ESC c 3 | Select paper sensor(s) to output paper-end signals | 67 |
| ESC c 4 | Select paper sensor(s) to stop printing | 68 |
| ESC c 5 | Enable/disable feed button | 69 |
| ESC d | Print and feed n lines | 70 |
| ESC i | Full cut | 70 |
| ESC j | Read from Non-Volatile Memory | 71 |
| ESC l | Start firmware upgrade mode | 71 |
| ESC m | Partial cut | 71 |
| ESC p | Generate pulse | 72 |
| ESC r | Set current color | 73 |
| ESC s | Write to Non-Volatile Memory (NVRAM) | 73 |
| ESC t | Select character code table | 74 |
| ESC u | Transmit Peripheral Device Status | 75 |
| ESC v | Transmit paper sensor status | 76 |
| ESC w n 7 | Receipt shooting flush | 77 |
| ESC w n 8 | Play melody from flash | 77 |
| ESC w n b | Special Wincor barcode parameter | 78 |
| ESC w n c | Switch the printer into Sleep-Mode. | 78 |
| ESC { | Turn upside-down printing mode on/off | 79 |
| FS ! (Asia version) | Select print mode(s) for Kanji characters | 81 |
| FS & (Asia version) | Select Kanji character mode | 81 |
| FS - (Asia version) | Turn underline mode on/off for Kanji characters | 82 |
| FS . (Asia version) | Cancel Kanji character mode | 82 |
| FS 2 (Asia version) | Define user-defined Kanji characters | 83 |
| FS C (Asia version) | Select Kanji character code system | 84 |
| FS S (Asia version) | Set Kanji character spacing | 84 |

| | | |
|---------------------------------|--|------------|
| FS W (Asia version) | Turn quadruple-size mode on/off for Kanji characters | 85 |
| GS ETX | Real time request to printer | 85 |
| GS EOT | Real time status transmission | 85 |
| GS ENQ | Real time printer status transmission | 86 |
| GS ! | Select character size | 87 |
| GS “ | Select memory type (SRAM/Flash) | 88 |
| GS “ U | Flash Memory User Sectors Allocation | 89 |
| GS # | Select the Current Logo | 90 |
| GS \$ | Set absolute vertical print position in page mode | 91 |
| GS (A | Executes test and diagnosis functions | 92 |
| GS (D | Enable/disable real-time command | 93 |
| GS (E | Customize NV memory | 94 |
| Function 1 | Changes into the user setting mode. | 96 |
| Function 2 | Ends user setting mode session. (Performs a software reset.) | 97 |
| Function 3 | Changes the memory switch. | 98 |
| Function 4 | Transmits the host the value for the memory switch. | 101 |
| Function 5 | Changes the customized setting values. | 102 |
| Function 6 | Transmits the customized setting values. | 109 |
| Function 11 | Sets communication condition of serial interface. | 114 |
| Function 12 | Transmits communication condition of serial interface. | 116 |
| Function 129 | Set serial number | 117 |
| Function 130 | Set production date | 117 |
| Function 131 | Sets communication condition of Ethernet interface. | 118 |
| Function 132 | Transmits communication condition of Ethernet interface. | 119 |
| GS (FGS (FGS (FGS (F | Set adjustment value(s) | 120 |
| GS (L | Specify graphics data | 122 |
| Function 48 | Sends the entire capacity of NV graphics domains. | 126 |
| Function 51 | Sends the available capacity of NV graphics memory. | 127 |
| Function 64 | Sends the key code list for defined NV graphics. | 129 |
| Function 65 | Performs batch deletion of all NV graphics data. | 130 |
| Function 66 | Deletes the specified NV graphics data. | 131 |
| Function 67 | Defines (in raster format) NV graphics data. | 132 |
| Function 69 | Prints the specified NV graphics. | 134 |
| GS * | Define downloaded bit image | 142 |
| GS / | Print downloaded bit image | 143 |
| GS : | Start/end macro definition | 145 |
| GS @ | Erase User Flash Sector | 146 |
| GS B | Turn white/black reverse printing mode on/off | 147 |
| GS H | Select printing position of HRI characters | 148 |
| GS I | Transmit printer ID | 149 |
| GS L | Set left margin | 153 |
| GS P | Set horizontal and vertical motion units | 154 |
| GS V | Select cut mode and cut paper | 155 |
| GS W | Set printing area width | 157 |
| GS \ | Set relative vertical print position in page mode | 158 |
| GS ^ | Execute macro | 159 |

| | | |
|----------------|--|------------|
| GS a | Enable/disable Automatic Status Back (ASB) | 160 |
| GS b | Turn smoothing mode on/off | 163 |
| GS f | Select font for HRI characters | 163 |
| GS g 0 | Initialize maintenance counter | 164 |
| GS g 2 | Transmit maintenance counter | 166 |
| GS h | Set bar code height | 168 |
| GS k | Print bar code | 169 |
| GS p | Select PDF 417 parameters | 183 |
| GS r | Transmit status | 185 |
| GS w | Set bar code width | 187 |
| GS 0x81 | Set paper type | 188 |
| GS 0x82 | Print raster monochrome graphics | 189 |
| GS 0x83 | Print raster color graphics | 189 |
| GS 0x84 | Download logo image | 190 |
| GS 0x8D | Text strike-through mode | 191 |
| GS 0x8E | Download paper type description | 192 |
| GS 0x8F | Return paper type description | 193 |
| GS 0xA0 | Set temporary max target speed | 193 |
| GS 0xFF | Reset firmware | 194 |
| US EOT | Convert 6-dots/mm bitmap to 8-dots/mm bitmap | 194 |
| US ENQ | Select superscript or subscript modes | 194 |
| US t | Print Test Form | 195 |
| US V | Send printer software version | 195 |
| US z | Real time commands disabled | 195 |

Commands sorted by function groups

Print commands

| | | |
|---------------|--|-----------|
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| FF | (1) Print and return to standard mode (in page mode) | 24 |
| FF | (2) Print and feed marked paper to print starting position | 24 |
| CR | Print and carriage return | 25 |
| NAK | Feed n Dot Rows | 32 |
| SYN | Add n Extra Dot Rows | 33 |
| ESC FF | Print data in page mode | 36 |
| ESC J | Print and feed paper | 57 |
| ESC d | Print and feed n lines | 70 |

Line spacing commands

| | | |
|--------------|------------------------------|-----------|
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Character commands

| | | |
|----------------|--|------------|
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| DC3 | Select Single-Wide Characters | 32 |
| CAN | Cancel print data in page mode | 34 |
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| ESC SP | Set right-side character spacing | 38 |
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| ESC \$ | Set absolute print position | 40 |
| ESC - | Turn underline mode on/off | 48 |
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| ESC E | Turn emphasized mode on/off | 56 |
| ESC I | Turn italic print mode on/off | 57 |
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| ESC R | Select an international character set | 59 |
| ESC V | Turn 90° clockwise rotation mode on/off | 62 |
| ESC r | Set current color | 73 |
| ESC t | Select character code table | 74 |
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| GS ! | Select character size | 87 |
| GS B | Turn white/black reverse printing mode on/off | 147 |
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Panel button commands

| | | |
|----------------|----------------------------|-----------|
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|----------------|----------------------------|-----------|

Paper sensor commands

| | | |
|----------------|--|-----------|
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Print position commands

| | | |
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| | | |
|---------------|---|------------|
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| ESC T | Select print direction in page mode | 61 |
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Bit-image commands (graphics)

| | | |
|------------------------------------|---|------------|
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| ESC * | Select bit-image mode | 44 |
| ESC * 1 | Select bit-image mode - Line Graphics | 46 |
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Status commands

| | | |
|------------------|-----------------------------------|------------|
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| ESC u | Transmit Peripheral Device Status | 75 |
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| | | |
|-------------|--|------------|
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Bar code commands

| | | |
|------------------|--|------------|
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| GS k | Print bar code | 169 |
| GS p | Select PDF 417 parameters | 183 |
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| GS H | Select printing position of HRI characters | 148 |
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Macro function commands

| | | |
|-------------|----------------------------|------------|
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| GS ^ | Execute macro | 159 |

Mechanism control commands (cut, cash drawer, tone)

| | | |
|------------------|--------------------------------|------------|
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| ESC i | Full cut | 70 |
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| EM | Full cut | 34 |
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| GS 0xA0 | Set temporary max target speed | 193 |

Kanji commands

| | | |
|--------------------------------|--|-----------|
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| FS & (Asia version) | Select Kanji character mode | 81 |
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Customize commands

| | | |
|---------------------|--|------------|
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| GS “ U | Flash Memory User Sectors Allocation | 89 |
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| Function 4 | Transmits the host the value for the memory switch. | 101 |
| Function 5 | Changes the customized setting values. | 102 |
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| Function 11 | Sets communication condition of serial interface. | 114 |
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| Function 129 | Set serial number | 117 |
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| Function 132 | Transmits communication condition of Ethernet interface. | 119 |
| GS (F | Set adjustment value(s) | 120 |
| GS @ | Erase User Flash Sector | 146 |
| GS 0x8E | Download paper type description | 192 |
| GS 0x8F | Return paper type description | 193 |

Control commands

| | | |
|------------------|-------------------------------------|------------|
| ESC = | Select peripheral device | 52 |
| ESC @ | Initialize printer | 54 |
| ESC I | Start firmware upgrade mode | 71 |
| ESC w n 7 | Receipt shooting flush | 77 |
| ESC w n c | Switch the printer into Sleep-Mode. | 78 |
| GS 0xFF | Reset firmware | 194 |

Pagemode

| | | |
|---------------|---|------------|
| CAN | Cancel print data in page mode | 34 |
| ESC FF | Print data in page mode | 36 |
| ESC L | Select page mode | 59 |
| ESC S | Select standard mode | 60 |
| ESC T | Select print direction in page mode | 61 |
| ESC W | Set printing area in page mode | 63 |
| GS \$ | Set absolute vertical print position in page mode | 91 |
| GS \ | Set relative vertical print position in page mode | 158 |

Resolution

| | | |
|-------------|--|------------|
| GS P | Set horizontal and vertical motion units | 154 |
|-------------|--|------------|

Real Time

| | | |
|------------------------|---------------------------------------|-----------|
| DLE | Clear printer | 25 |
| DLE EOT | Real time status transmission | 26 |
| DLE ENQ | Real time request to printer | 29 |
| DLE SO (fn = 2) | Turn off the power | 30 |
| GS ETX | Real time request to printer | 85 |
| GS EOT | Real time status transmission | 85 |
| GS ENQ | Real time printer status transmission | 86 |
| GS (D | Enable/disable real-time command | 93 |

Statistics

| | | |
|---------------|--------------------------------|------------|
| GS g 0 | Initialize maintenance counter | 164 |
| GS g 2 | Transmit maintenance counter | 166 |

User defined characters

| | | |
|------------------|--|-----------|
| ESC % | Select/cancel user-defined character set | 41 |
| ESC & | Define user-defined characters | 41 |
| ESC ? | Cancel user-defined characters | 53 |

Test

| | | |
|---------------|---------------------------------------|------------|
| GS (A | Executes test and diagnosis functions | 92 |
| US t | Print Test Form | 195 |
| US z | Real time commands disabled | 195 |

Ignored Commands

The following commands are ignored:

DLE; ESC c 0; ESC c 1; ESC c 3; ESC c 6; ESC j; ESC s

Description of the Control Characters and Sequences:

HT

| | |
|---------------------|---|
| Function: | Horizontal tab |
| Code ASCII: | HT |
| Code HEX: | 0x09 |
| Description: | Moves the printing position to the next horizontal tab. |
| Notes: | <ul style="list-style-type: none">• This command is ignored unless the next horizontal tab position has been set.• Horizontal tab positions are set by ESC D.• If the next horizontal tab position exceeds the printing area, the printer sets the printing position to [Printing area width + 1].• If this command is processed when the printing position is at [Printing area width + 1], the printer executes print buffer-full printing of the current line and horizontal tab processing from the beginning of the next line. In this case, in page mode, the printer does not execute printing, but the printing position is moved.• When underline mode is turned on, the underline will not be printed under the tab space skipped by this command. |
| Reference: | ESC D, ESC 3 |

LF

| | |
|---------------------|--|
| Function: | Print and line feed |
| Code ASCII: | LF |
| Code HEX: | 0x0A |
| Description: | Prints the data in the print buffer and feeds one line. |
| Notes: | <ul style="list-style-type: none">• If auto linefeed enabled, command is ignored after CR.• The amount of paper fed per line is based on the value set using the line spacing command ESC 2 (see page 49), or ESC 3 (see page 50).• After printing, the printing position moves to the beginning of the line. When a left margin is set in standard mode, the position of the left margin is the beginning of the line.• When this command is processed in page mode, only the printing position moves, and the printer does not perform actual printing.• When the origin of layout is selected to bottom of label or top of black mark in standard mode and a paper feed amount that exceeds the remaining printable area of the label is sent, the printer executes one of the following:<ul style="list-style-type: none">- If the printer will print a line that is higher than the remaining printable area of the label, the printer feeds the label to the next print starting position and the printer executes this command. |

- - If the printer will print in the remaining printable area of the label, but the feed amount exceeds the remaining printable area of the label, the printer prints the label and feeds to bottom of the label.

Reference: ESC 2, ESC 3, ETB

FF

Function: (1) Print and return to standard mode (in page mode)
Code ASCII: FF
Code HEX: 0x0C
Description: In page mode, prints the data in the print buffer collectively and returns to standard mode.
Notes:

- This command is enabled only in page mode.
- The data is deleted in the printing area after being printed.
- This command returns the values set by ESC W to the default values.
- The value set by ESC T is maintained.
- After printing, the printing position moves to the beginning of the line. When a left margin is set, the position of the left margin is the beginning of the line.

FF

Function: (2) Print and feed marked paper to print starting position
Code ASCII: FF
Code HEX: 0x0C
Description: Prints the data in the print buffer and feeds marked paper to the print starting position.
Notes:

- If the BM sensor is enabled by using memory switch 0x80 the printer feeds the marked paper to the next mark position.
- If the paper is at the print starting position and there is no data in the print buffer, this command is ignored.
- If the BM sensor is enabled by using memory switch 0x80 the minimum foot loss is > 5 mm.
- After printing, the printing position moves to the beginning of the line. When a left margin is set, the position of the left margin is the beginning of the line.

Reference: Memory switch (see page 98)

CR

Function: Print and carriage return

Code ASCII: CR

Code HEX: 0x0D

Description:

| When automatic line feed is enabled | When automatic line feed is disabled |
|---------------------------------------|--------------------------------------|
| Executes printing one line feed as LF | This command is ignored |

Notes:

- After printing, the printing position moves to the beginning of the line. When a left margin is set in standard mode, the position of the left margin is the beginning of the line.
- When this command is processed in page mode, only the printing position moves and the printer do not perform actual printing.

DLE

Function: Clear printer (This command is ignored)

Code ASCII: DLE

Code HEX: 0x10

Description: Clears the print line buffer without printing and sets the printer to the following condition:

- Double-wide command (0x12) is canceled
- Line spacing, pitch and user-defined character sets are maintained at current selections (RAM is not affected)
- Single-wide, single-high, non-rotated, and left-aligned characters are set
- Printer is restarted and error status is cleared in a fault condition
- Printing position is set to column one
- Knife is homed

Notes:

- A DLE command followed by a 04 or 05 is interpreted as a “Real Time Command”.

Reference: DLE ENQ, DLE EOT and DLE SO (fn = 2)

DLE EOT

Function: Real time status transmission

Code ASCII: DLE EOT **n**

Code HEX: 0x10 0x04 **n**

Range: $1 \leq n \leq 4$

Description: Transmits 1 byte of status data specified in real time, using **n** as follows:

| n | Function |
|----------|-----------------------------------|
| 1 | Transmit printer status |
| 2 | Transmit busy status |
| 3 | Transmit error status |
| 4 | Transmit paper roll sensor status |

Notes:

- This is a real-time command that the printer executes upon receiving it. Take the following into consideration:
 - If this command interrupts the code string of another command, this command is processed as a parameter of the other command; therefore, the print result will not be correct.
 - If a command such as bit-image or defined data has a code string that is the same as a code string in a parameter, the printer processes and then continues with the bit-image or other command.
- This command is executed even when the printer is offline or an error occurs.
- If the receive buffer is full the execution depends from Memory Switch 2-8 (Listen to Real-Time-Commands - see command GS (E).
 - If Memory Switch 2-8 is set to off (48): command is executed.
 - If Memory Switch 2-8 is set to on (49): command is not executed.
- This command can be used when the printer is disabled by **ESC =**.
- When transmitting block data (Header ~ NUL), the status will be sent after that.
- Each status equals 1 byte.
- This command can be disabled by US z (page 195).
- This command is identical to command GS EOT.

The status to be transmitted is as follows:

n = 1 (printer status)

| Bit | Function | Value | |
|------------|---------------------------------|--------------|----------|
| | | 0 | 1 |
| 0 | Not used | Fixed to 0 | |
| 1 | Not used | Fixed to 1 | |
| 2 | Drawer kick-out connector pin 3 | Low | High |
| 3 | Busy | Not Busy | Busy |

| | | | |
|---|------------------|------------------------------------|-------------------------------|
| 4 | Not used | Fixed to 1 | |
| 5 | Customer display | Not connected or Handshake blocked | Connected and Handshake ready |
| 6 | Undefined | | |
| 7 | Not used | Fixed to 0 | |

Bit 3: Busy is set when the printer enters the Offline State (see chapter [Online / Offline State Diagram](#)) or if the receive buffer is nearly full.

n = 2 (busy status)

| Bit | Function | Value | |
|-----|--------------------------------------|-----------------------|-------------------|
| | | 0 | 1 |
| 0 | Not used | Fixed to 0 | |
| 1 | Not used | Fixed to 1 | |
| 2 | Cover | Closed | Open |
| 3 | Paper feeding with paper feed button | Not during paper feed | During paper feed |
| 4 | Not used | Fixed to 1 | |
| 5 | Printing stop due to a paper end | No paper end stop | Printing stops |
| 6 | Recoverable Error | No error | Error occurred |
| 7 | Not used | Fixed to 0 | |

Bit 5: Bit 5 becomes “1” as sensor of the roll paper detects the paper not present made to the print stop.

Bit 6: Recoverable Error means Cover open, Paper out, Black mark error, Cutter error.

n = 3 (error status)

| Bit | Function | Value | |
|-----|---------------------|------------|----------------|
| | | 0 | 1 |
| 0 | Not used | Fixed to 0 | |
| 1 | Not used | Fixed to 1 | |
| 2 | Undefined | | |
| 3 | Cutter error | No error | Error occurred |
| 4 | Not used | Fixed to 1 | |
| 5 | Undefined | | |
| 6 | Unrecoverable Error | No error | Error occurred |
| 7 | Not used | Fixed to 0 | |

Bit 6: Thermistor error, High voltage error or Low voltage error. Thermistor error is an unrecoverable error. High voltage error and Low voltage error are automatic recoverable errors!

n = 4 (paper roll sensor status)

| Bit | Function | Value | |
|-----|-----------------------|---------------|----------|
| | | 0 | 1 |
| 0 | Not used | Fixed to 0 | |
| 1 | Not used | Fixed to 1 | |
| 2 | Paper near end sensor | Paper present | No paper |
| 3 | Paper near end sensor | Paper present | No paper |
| 4 | Not used | Fixed to 1 | |
| 5 | Paper end sensor | Paper present | No paper |
| 6 | Paper end sensor | Paper present | No paper |
| 7 | Not used | Fixed to 0 | |

Bit 2 and Bit 3: To avoid false reports the paper near end sensor is monitored by a 0.2 m paper feed hysteresis. That means the printer doesn't report paper near end to the host until 0.2 m paper is feed and all the time the paper near end sensor detects no paper! If the linefeed button is pressed within the hysteresis, the printer reports paper near end immediately.

Notes:

- Real time status can be differentiated by the information of bits 0, 1, 4, and 7 from other transmission data. If the data transmitted from the printer is "0xx1xx10" (x = 0 or 1), process the data as a real time status.
- When the paper roll cover is open, paper detection (detected by the paper roll end sensor) may be incorrect.
- Do not embed this command within another command. For example: Bit image data might include this command.

Reference:

Command GS EOT; Table for the Transmit Status Identification

DLE ENQ

Function: Real time request to printer

Code ASCII: DLE ENQ **n**

Code HEX: 0x10 0x05 **n**

Range: $1 \leq n \leq 2$

Description: Responds to a request in real time from the host system. **n** specifies the request as follows:

| n | Request |
|----------|--|
| 1 | Restarts printing from the beginning of the line where an error occurred, after recovering from the error. |
| 2 | Recover from an error after clearing the data in the receive buffer and print buffers. |

Notes:

- This is a real-time command that the printer executes upon receiving it. Note the following when using this command.
 - If this command is embedded within the code string of another command, it is processed as a parameter of the other command, and the print result is not correct.
 - If another command (such as bit image or defined data) has a code string in a parameter that is the same as this command, the printer starts processing this command.
- This command is executed even when the printer is offline
- If the receive buffer is full the execution depends from Memory Switch 2-8 (Listen to Real-Time-Commands - see command GS (E).
 - If Memory Switch 2-8 is set to off (48): command is executed.
 - If Memory Switch 2-8 is set to on (49): command is not executed.
- When a recoverable error occurs, after removing the cause of the error, the printer can recover from the error by transmitting DLE ENQ 1 or DLE ENQ 2 without the printer being turned off.
- DLE ENQ 1 or DLE ENQ 2 is enabled only when a recoverable error occurs, with the exception of an automatically recovered error, and is ignored in other cases. Errors recoverable by DLE ENQ 1 or DLE ENQ 2 depend on the printer model.
- DLE ENQ 1 or DLE ENQ 2 is also executed to recover from a recoverable error when the printer is disabled by ESC =.
- In page mode, if the printer recovers from a recoverable error by using DLE ENQ 2, the printer returns to standard mode after clearing the data in receive and print buffers and changing the values set by ESC W to the default values.
- After processing DLE ENQ 2, the printing position is moved to the left side of the printable area. Printer is in the status "beginning of the line," or "there is data in the print buffer."
- If the value of **n** is out of the specified range, this command is ignored.
- A description of the different errors and the error blink patterns can be found on page 285.
- This command can be disabled by US z.

- This command is identical to command GS ETX.

Reference: Command GS ETX (see page 85); Table for the Transmit Status Identification

DLE SO (fn = 2)

Function: Turn off the power

Code ASCII: DLE SO fn a b

Code HEX: 0x10 0x0E 0x02 a b

Range: fn = 2

a = 1

b = 8

Description: Executes the following in a power-off sequence:

- Sends "Power off notice."
- Wait for 250 ms.
- Turn off the printer

- Notes:**
- You will find additional information about "Power off control by host" on page 9).
 - The behavior of the Power Button is described on page 7).
 - This is a real-time command that the printer executes upon receiving it. Note the following when using this command.
 - If this command is embedded within the code string of another command, it is processed as a parameter of the other command, and the print result is not correct.
 - If another command (such as bit image or defined data) has a code string in a parameter that is the same as this command, the printer starts processing this command.
 - This command can be enabled or disabled by GS (D (page 93) and US z (page 195). The default value is disabled.
 - The printer executes this command even when it is in offline or error status.
 - If the receive buffer is full the execution depends from Memory Switch 2-8 (Listen to Real-Time-Commands - see command GS (E).
 - If Memory Switch 2-8 is set to off (48): command is executed.
 - If Memory Switch 2-8 is set to on (49): command is not executed.
 - This command is effective when the printer is disabled by ESC = (select peripheral device).
 - All information and data stored in RAM will be deleted by processing this command.

- When the power is turned off, the printer transmits [header + status + NUL] to the host.

| Power off notice | Hex | Decimal | Data |
|------------------|------|---------|--------|
| Header | 0x3B | 59 | 1 byte |
| Status | 0x30 | 48 | 1 byte |
| NUL | 0x00 | 0 | 1 byte |

- The power-off notice can be differentiated from other transmission data. When the data transmitted from the printer is [Hex=0x3B/Decimal=59], the host should process 3 bytes of data up to NUL as the notice from the printer. If the second byte is [Hex=30H/Decimal=48], this is the power off notice. An exception is described below:
 - When the host is communicating with the printer by XON/XOFF control, an XOFF code might interrupt [Header ~ NUL].
- In iPRINT this command leads to a virtual pressing of the power button. Depending of the settings in the Operating System the behavior is different (hibernation, power down, do nothing...). The TH230+ printer part of the iPRINT system follows the achieved power state.

Reference: Table for the Transmit Status Identification

DC1

Function: Print raster monochrome graphics
Code ASCII: DC1 **n1 ... n72** (576 dots, 80 mm paper), **or n51** (408 dots, 57.5 mm paper)
Code HEX: 0x11 **n1 ... n72** (576 dots for 80 mm paper), **or n51** (408 dots for 57.5 mm paper)
Range: **n1 to n72/n51** corresponds to one dot row data for a thermal receipt printer
Description: This command is identical to command GS 0x82.

DC2

Function: Select Double-Wide Characters
Code ASCII: DC2
Code HEX: 0x12
Description: Prints double-wide characters. The printer is reset to single-wide mode after a line has been printed or the Clear Printer (0x10) command is received. Double-wide characters may be used in the same line with single-wide characters.
Reference: ESC ! (see page 39), GS !

DC3

Function: Select Single-Wide Characters
Code ASCII: DC3
Code HEX: 0x13
Description: Prints single-wide characters. Single-wide characters may be used in the same line with double-wide characters.
Reference: ESC ! (see page 39), GS !

DC4

Function: Feed n Print Lines
Code ASCII: DC4 **n**
Code HEX: 0x14 **n**
Range: $0 \leq n \leq 255$
Description: Feeds the paper n lines at the current line height without printing.
Notes:

- This command is enabled only when processed at the beginning of the line.
- New applications should use the command ESC d!

NAK

Function: Feed n Dot Rows
Code ASCII: NAK **n**
Code HEX: 0x15 **n**
Range: $0 \leq n \leq 255$
Description: Feeds the paper n dot rows (n/8 mm, n/203 inch), without printing.
Notes:

- Value of **n**: n/203 inch
- New applications should use the command ESC J.

SYN**Function:** Add n Extra Dot Rows**Code ASCII:** SYN n **Code HEX:** 0x16 n **Range:** $0 \leq n \leq 16$ **Default:** $n = 3$ extra dot rows**Description:** Adds n extra dot rows ($n/8$ mm, $n/203$ inch) to the character height to increase space between print lines or decrease the number of lines per inch.

The following table shows the relationship between the number of lines per inch and each extra dot row added:

| Extra Rows | Lines Per Inch | Dot Rows | | Extra Rows | Lines Per Inch | Dot Rows |
|------------|----------------|----------|--|------------|----------------|----------|
| 0 | 8.5 | 24 | | 9 | 6.1 | 33 |
| 1 | 8.1 | 25 | | 10 | 6.0 | 34 |
| 2 | 7.8 | 26 | | 11 | 5.8 | 35 |
| 3 | 7.5 | 27 | | 12 | 5.6 | 36 |
| 4 | 7.2 | 28 | | 13 | 5.5 | 37 |
| 5 | 7.0 | 29 | | 14 | 5.3 | 38 |
| 6 | 6.8 | 30 | | 15 | 5.2 | 39 |
| 7 | 6.5 | 31 | | 16 | 5.1 | 40 |
| 8 | 6.3 | 32 | | | | |

Notes:

- New applications should use the command ESC 3 (see page 50)!

Reference: ESC 2 (see page 49), ESC 3 (see page 50)**ETB****Function:** Print**Code ASCII:** ETB**Code HEX:** 0x17**Description:** Prints one line from the buffer and feeds paper one line. Executes LF on receipt.**Reference:** LF (see page 23)

CAN

- Function:** Cancel print data in page mode
- Code ASCII:** CAN
- Code HEX:** 0x18
- Description:** In page mode, deletes all the print data for the current printing area.
- Notes:**
- This command is enabled only in page mode
 - If data set in the previously specified printing area is set in the currently specified printing area, it is deleted.

EM

- Function:** Full cut
- Code ASCII:** EM
- Code HEX:** 0x19
- Description:** This command is the same like ESC i (see page 70).
- Notes:**
- WINCOR NIXDORF suggests using the newer command GS V (see page 155) to cut the receipt.
 - If not at beginning of line, a linefeed will be done

SUB

- Function:** Partial cut
- Code ASCII:** SUB
- Code HEX:** 0x1A
- Description:** This command is the same like ESC m (see page 71).
- Notes:**
- WINCOR NIXDORF suggests using the newer command GS V (see page 155) to cut the receipt.
 - If not at beginning of line, a linefeed will be done

ESC (*.BMP file)

Function: Download BMP logo

Code ASCII: ESC (*.BMP file)

Code HEX: 0x1B (*.BMP file)

Range: Maximum width = 576
Maximum height = 512

Description: Enters a downloaded BMP logo into RAM or flash.

The downloaded BMP logo can be printed by using the print downloaded bit image (1D 2F m) command.

To download BMP file to save it as a logo, send the hexadecimal code 1B followed by the whole BMP file.

The printer decodes the BMP file header and will save the image data after checking important parameters, such as:

- Width,
- Height,
- Number of colors (only monochrome images are accepted)

BMPs and bit images continue to be definable only for the receipt station. However, there is no longer an automatic erasure whenever the user downloads a character set (as happened previously) as well as in the case where the current logo was never set > 0, (the automatic erasure if user flash memory had filled up with inactive logo 0 definitions upon next power cycle). Warnings about the effect of running out of defined logo space during a download apply (i.e. the command is ignored). The application is required to manage user data space, downloaded font space, and logo space.

After downloading a logo to the printer, wait 100 ms to allow the printer time to write the logo to flash.

- Notes:**
- Images wider than the maximum width will be cutted on the right side
 - Images higher than the maximum width will be ignored.
 - Exceptions: BMP file images that are not monochrome are put into the print buffer.
 - Related information: Microsoft BMP bitmap file format.

ESC BEL

| | |
|---------------------|--|
| Function: | Generate tone |
| Code ASCII: | ESC BEL |
| Code HEX: | 0x1B 0x07 |
| Description: | Generates an audible tone. Performed by the printer to signal certain conditions. |
| Notes: | <ul style="list-style-type: none"> If you use ESC BEL after a print instruction, the printer generates the audible tone not until print completion. Thus, the tone is synchronized with printing. |

ESC FF

| | |
|---------------------|---|
| Function: | Print data in page mode |
| Code ASCII: | ESC FF |
| Code HEX: | 0x1B 0x0C |
| Range: | None |
| Description: | In page mode, prints all buffered data in the printable area collectively. |
| Notes: | <ul style="list-style-type: none"> This command is enabled only in page mode. After printing, the printer does not clear the buffered data, the printing position, or values set by other commands. The printer returns to standard mode with FF, ESC S, and ESC @. When it returns to standard mode by ESC @, all settings are cancelled. |

ESC DC2

| | |
|---------------------|--|
| Function: | Select 90 Degree Counter-Clockwise Rotated Print |
| Code ASCII: | ESC DC2 |
| Code HEX: | 0x1B 0x12 |
| Description: | Rotates characters 90 degrees counter-clockwise. The command remains in effect until the printer is reset or until a Init printer (0x1B 0x40) or Cancel Rotated Print (0x1B 0x56) command is received. |

ESC DC4

- Function:** Set Column
- Code ASCII:** ESC DC4 **n**
- Code HEX:** 0x1B 0x14 **n**
- Range:** $1 \leq n \leq 45$ (Standard pitch)
 $1 \leq n \leq 56$ (Compressed pitch)
- Default:** **n** = 1
- Description:** Prints the first character of the next print line in column **n**. This command must be sent for each line not printed at column one. The value of **n** is set to one after each line.
- Notes:**
- If the value of **n** is out of the specified range, the command is ignored and the value of **n** is set to one.
 - Double width: This command prints the first character of the print line depending of the actual font. Therefore this command is not influenced by the Double with command (ESC !) or the Select character size command (GS !).

ESC SYN

- Function:** Select Pitch (Column Width)
- Code ASCII:** ESC SYN **n**
- Code HEX:** 0x1B 0x16 **n**
- Range:** $0 \leq n \leq 1$
n = 0 (Standard pitch = Font A)
n = 1 (Compressed pitch = Font B)
- Default:** **n** = 0 (Standard pitch)
- Description:** The following table provides the print characteristics for both pitches on the receipt station.

| Pitch | Dots | Columns 80 mm Paper | Columns 57.5 mm Paper | CPI |
|---------------------|------------|------------------------|-----------------------------|------|
| Standard (Font A) | 13 x 24 | 44 | 31 | 15.6 |
| Compressed (Font B) | 10 x 24 | 57 | 40 | 20.3 |

- Notes:**
- This command and the command ESC ! affect pitch selection.

ESC SP

Function: Set right-side character spacing

Code ASCII: ESC SP n

Code HEX: 0x1B 0x20 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Sets the right-side character spacing to n × (horizontal or vertical motion unit).

- Notes:**
- The right-side character spacing set by this command is effective for all characters (except for HRI characters).
 - When characters are enlarged, the right-side character spacing is n times normal value. The right-side character spacing for double-width mode is twice the normal value.
 - When standard mode is selected, the horizontal motion unit is used.
 - When page mode is selected, the vertical or horizontal motion unit is used for the print direction set by ESC T.
 - When the starting position is set to the upper left or lower right of the printing area using ESC T, the horizontal motion unit is used.
 - When the starting position is set to the upper right or lower left of the printing area using ESC T, the vertical motion unit is used.
 - The right-side character spacing can be set independently in standard mode and in page mode.
 - This command is used to change the spacing between characters.
 - GS P specifies the vertical or horizontal motion unit.
 - The settings of this command are effective until ESC @ is executed, the printer is reset, or the power is turned off.
 - Changes in the horizontal or vertical units do not affect the current right side character spacing.

ESC !

Function: Select print mode(s)

Code ASCII: ESC ! n

Code HEX: 0x1B 0x21 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Selects or cancels print modes collectively (Emphasized, Double-height, Double-width, Underline) using n as follows:

| Bit | Function | Value | |
|-----|-------------------------|----------|---------|
| | | 0 | 1 |
| 0 | Selected character font | Font A | Font B |
| 1 | Undefined | - | - |
| 2 | Undefined | - | - |
| 3 | Emphasized mode | Disabled | Enabled |
| 4 | Double-height mode | Disabled | Enabled |
| 5 | Double-width mode | Disabled | Enabled |
| 6 | Undefined | - | - |
| 7 | Underline mode | Disabled | Enabled |

Notes:

- Functions for each bit can also be executed by the following commands:
 - Bit 0 (Character font): ESC SYN
 - Bit 3 (Emphasized mode): ESC E
 - Bit 4, 5 (Character size): GS !,
DC2,
DC3
 - Bit 7 (Underline mode): ESC -
- The print modes set by this command are effective for all characters (except for HRI characters).
- When some characters in a line are double-height, all characters on the line are aligned at the baseline.
- When double-width mode is turned on, the characters are enlarged to the right, based on the left side of the character.
- When both double-height and double-width modes are turned on, quadruple size characters are printed.
- In standard mode, the character is enlarged in the paper feed direction when double-height mode is selected, and it is enlarged perpendicular to the paper feed direction when double-width mode is selected.
 - However, when character orientation changes in 90° clockwise-rotated mode, the relationship between double-height and double-width is reversed.
- In page mode, double-height and double-width are on the character orientation.

- The underline thickness is that specified by ESC –, regardless of the character size.
- When underline mode is turned on, 90° clockwise-rotated characters and white/black reverse characters cannot be underlined.
- The printer cannot underline the space set by HT, ESC \$, and ESC \.
- Character configurations Bit 0:

| Pitch | Dots | Columns 80 mm Paper | Columns 57.5 mm Paper | CPI |
|--------|---------|---------------------------|-----------------------------|------|
| Font A | 13 x 24 | 44 | 31 | 15.6 |
| Font B | 10 x 24 | 57 | 40 | 20.3 |

- The settings of this command are effective until ESC @ is executed, the printer is reset, or the power is turned off.
- The emphasized mode is not effective if smooth mode on (GS b)

ESC \$

Function: Set absolute print position

Code ASCII: ESC \$ n_L n_H

Code HEX: 0x1B 0x24 n_L n_H

Range: $0 \leq n_L \leq 255$
 $0 \leq n_H \leq 255$

Default: $n_L + n_H \times 256 = 0$

Description: Sets the print starting position to $(n_L + n_H \times 256) \times$ (horizontal or vertical motion unit) from the beginning of the line.

- Notes:**
- The printer ignores any setting that exceeds the printing area.
 - When standard mode is selected, the horizontal motion unit is used.
 - When page mode is selected, the horizontal or vertical motion unit is used for the print direction set by ESC T.
 - When the starting position is set to the upper left or lower right of the printing area using ESC T, the horizontal motion unit is used.
 - When the starting position is set to the upper right or lower left of the printing area using ESC T, the vertical motion unit is used.
 - Even if the vertical or horizontal motion unit is changed after changing the printing position, the setting of the printing position will not be changed.
 - Even if underline mode is turned on, the underline will not be printed under the space skipped by this command.
 - The vertical or horizontal motion unit is specified by GS P.

- After command, printer isn't at start of line, independent from given value ($nL + nH \times 256$)

ESC %

Function: Select/cancel user-defined character set

Code ASCII: ESC % n

Code HEX: 0x1B 0x25 n

Range: $0 \leq n \leq 255$

Default: $n = 0$

Description: Selects or cancels the user-defined character set.

- When the LSB of n is 0, the user-defined character set is cancelled.
- When the LSB of n is 1, the user-defined character set is selected.

- Notes:**
- When the user-defined character set is cancelled, the resident character set is automatically selected.
 - Settings of this command are effective until ESC @ is executed, the printer is reset, or the power is turned off.

ESC &

Function: Define user-defined characters

Code ASCII: ESC & y c1 c2 [x1 d1...d(y * x1)] ... [xk d1 ... d(y * xk)]

Code HEX: 0x1B 0x26 0x03 c1 c2 [x1 d1...d(y * x1)] ... [xk d1 ... d(y * xk)]

Range:
 $y = 3$
 $32 \leq c1 \leq c2 \leq 255$
 $0 \leq x \leq 16$
 $0 \leq d \leq 255$
 $k = c2 - c1 + 1$

Description: Defines user-defined characters from character code check **c1** to **c2**.

- **y** specifies the number of bytes in the vertical direction.
- **x** specifies the number of dots in the horizontal direction.
- **d** is the dot data for the user-defined characters.

- Notes:**
- Character codes from the alphanumeric characters (20H (decimal 32) to FFH (decimal 255)) can be defined.
 - Data **d** specifies a bit printed to 1 and not printed to 0. The dot pattern is in the horizontal direction from the left side. Any remaining dots on the right side are blank.
 - The data to define a user-defined character is (**y * x**) bytes.
 - When the value of **y**, **c1**, **c2**, or **x** is out of the range, this command is cancelled, and the following data is processed as normal data.
 - This command can define user-defined characters for each font (Font A or Font B) independently. To select a font, use ESC !.

- Once the user-defined characters have been defined, depend from the selected memory (GS “) they are stored in SRAM or in Flash. If the character stored in SRAM, it will be available until ESC ?, or ESC @ is executed the power is turned off; or the printer is reset.
- SRAM is always preferred against the Flash. The Flash works like a backup medium for the SRAM (see 0)
- The relationship between the definition data and printing result is as follows- see example below.

| 0 | 1 | ... | n | |
|----|----|-----|------|-----|
| d1 | d4 | ... | dk-2 | MSB |
| | | | | LSB |
| d2 | d5 | ... | dk-1 | MSB |
| | | | | LSB |
| d3 | d6 | ... | dk | MSB |
| | | | | LSB |

ESC ‘**Function:**

Code ASCII: ESC ‘ m a0 a1 a2 d1 ... dm

Code HEX: 0x1B 0x27 m a0 a1 a2 d1 ... dm

Range: $0 \leq m \leq 255$

Default: None

Description: Writes **m** bytes of data to the User Data Storage Flash Page at the address specified in **a0** (MSB) to **a2** (LSB). The printer waits for **m** bytes of data following the 3-byte address.

Notes:

- **m** = 0 equals 256 byte of data.
- If any of the memory locations addressed by this command are not currently erased, the command is not executed.
- Result of this write is returned in bit 2 of response to transmit status command 0x1D 0x72, **n** = 4.

ESC *

Function: Select bit-image mode

Code ASCII: ESC * m nL nH d1 ... dk

Code HEX: 0x1B 0x2A m nL nH d1 ... dk

Range: m = 0, 1, 32, 33, 49, 98

$0 \leq n_L \leq 255$

$0 \leq n_H \leq 3$

$0 \leq d \leq 255$

$k = n_L + n_H \times 256$ [in case of m = 0, 1]

$k = (n_L + n_H \times 256) \times 3$ [in case of m = 32, 33]

Description: Selects a bit-image mode using m=0,1,32,33 for the number of dots specified by (n_L + n_H × 256) as follows:

| m | Mode | Number of bits for vertical data | Dot density in horizontal | Amount of data (k) |
|----|---------------------------------|----------------------------------|---------------------------|-----------------------------------|
| 0 | 8-dot single-density | 8 | Single-density | $n_L + n_H \times 256$ |
| 1 | 8-dot double-density | 8 | Double-density | $n_L + n_H \times 256$ |
| 32 | 24-dot single-density | 24 | Single-density | $(n_L + n_H \times 256) \times 3$ |
| 33 | 24-dot double-density | 24 | Double-density | $(n_L + n_H \times 256) \times 3$ |
| 49 | Command ESC * 1 (see page 46) | | | |
| 98 | Command ESC * b m (see page 47) | | | |

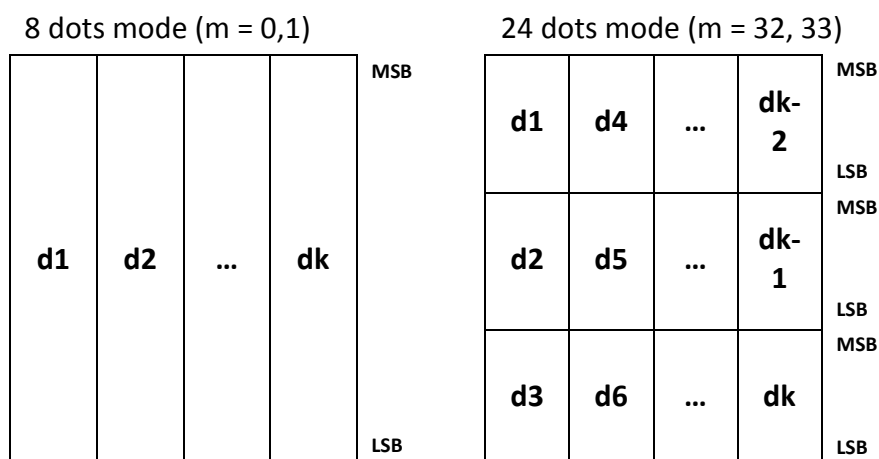
d indicates the bit image data.

If m=49, d1..dk defines a line graphics (see GS 0x83).

If m=62,

Notes:

- Data d specifies a bit printed to 1 and not printed to 0.
- If the bit image data exceeds the number of dots to be printed on a line, the excess data is ignored.
- The bit-image is not affected by print mode (emphasized, double-strike, underline, character size, white/black reverse printing, or 90° clockwise-rotated), except for upside-down printing mode.
- After printing a bit image, the printer processes normal data.
- This command is used to print a picture or logo.
- The relationship between the bit image data and the print result is as follows.



- The modes selectable by m are as follows:
“Vertical” is in the direction of paper feeding and “horizontal” is perpendicular (at right angles) to the direction of paper feeding.
- See Functions 5 and 6 of GS (E to specify the paper width and paper (2-color paper/monochrome paper).
- See Functions 3 and 4 of GS (E for the memory switch.
- When both standard mode and page mode are selected (a starting point specified by ESC T is upper left or lower right).

| m | Mode | Vertical dot density | Horizontal | | | |
|----|-----------------------|----------------------|-------------|-------------------|------------------------|---------------------|
| | | | Dot density | Set adjacent dots | Maximum number of dots | |
| | | | | | Paper width 80 mm | Paper width 57.5 mm |
| | | | | | 576 dot | 408 dot |
| 0 | 8-dot single-density | 203/3 dpi | 203/2dpi | Permitted | 288 | 204 |
| 1 | 8-dot double-density | 203/3 dpi | 203 dpi | Permitted | 576 | 408 |
| 32 | 24-dot single-density | 203 dpi | 203/2dpi | Permitted | 288 | 204 |
| 33 | 24-dot double-density | 203 dpi | 203 dpi | Permitted | 576 | 408 |

When the starting position specified by ESC T is upper right or lower left in page mode.

| m | Mode | Vertical | | | Horizontal dot density |
|----|-----------------------|-------------|-------------------|------------------------|------------------------|
| | | Dot density | Set adjacent dots | Maximum number of dots | |
| 0 | 8-dot single-density | 203/2 dpi | Permitted | 288 | 203/3 dpi |
| 1 | 8-dot double-density | 203 dpi | Permitted | 576 | 203/3 dpi |
| 32 | 24-dot single-density | 203/2 dpi | Permitted | 288 | 203 dpi |
| 33 | 24-dot double-density | 203 dpi | Permitted | 576 | 203 dpi |

90° or 270° rotated bit-image data will be printed.

dpi: dots per 25.4 mm (dots per inch)

ESC * 1 n_L n_H [d] n_L + 256 * n_H

Function: Select bit-image mode - Line Graphics

Code ASCII: ESC * 1 n_L n_H d1 ... dk

Code HEX: 0x1B 0x2A 0x31 n_L n_H d1 ... dk

Range:
 $0 \leq n_L \leq 255$
 $0 \leq n_H \leq 255$
 $0 \leq d \leq 255$
 $k = n_L + n_H \times 256$

Description: Selects a bit-image mode for a single line graphics.

- Notes:**
- The command is enabled only when input at the beginning of the line.
 - [d] contains n_L + 256 * n_H data byte and contains the pixel information beginning with the actual position.
 - The MSB of the first byte corresponds to the first pixel (on the left side) and the LSB of the last byte corresponds to the last pixel (on the right side).
 - If a data bit is set the corresponding pixel is switched on.
 - If the number of columns determined in this way is smaller than the printing area, the remaining pixels are filled with zeros.
 - If the number of columns determined in this way is larger than the printing area, the extra data bytes have no effect and are ignored.
 - After the graphics has been printed, the printer returns to the normal data processing mode.
 - After the graphics has been printed, the cursor is at the print starting position.
 - The typical data length is 72 bytes (= 576 dots). If the data length is greater than 72 bytes, only 72 bytes are printed but the remaining bytes are read and deleted.

- The driver has to send 148 nullbytes to the printer before the printer is opened by the application. Thus it is guaranteed that the printer has left the graphics function even if the graphics data stream was interrupted.
- If two-color paper is selected, two lines will be merged to one line. The first line defines the secondary color (i.e. red) and second line defines the primary color (black). is the For each printed dot row starting at the top left, two-part bit strings are used to define (in the first half), all dots that are of either color (i.e. not white). The second half string defines only the dots where the color is black.

Caution: If two-color paper is selected, two lines for one line are exepcted. Der internal Buffer collects 256 lines. If one line missed, the whole buffer will be restrained until the lost line or another command follows.

- If the compression bit is set by ESC * b m.
- If decompression activated, data bit will be decompressed with TIFF 4.0 Packbits Decompression.
- TIFF 4.0 Compression pseudo code:

```

for (all packed bytes)
{
    n = next byte;
    if (0 ≤ n ≤ 127)
        Take on the next n+1 byte directly;
    else
        // -128 ≤ n ≤ -1
        Copy the next byte (-n+1)-times;
}

```

ESC * b m n

| | |
|---------------------|--|
| Function: | Turn on/off TIFF compression |
| Code ASCII: | ESC * b m n |
| Code HEX: | 0x1B 0x2A 0x62 0x6d n |
| Range: | n = 0, 2, 48, 50 |
| Default: | n = 0 |
| Description: | Turns the TIFF compression on (n = 2, 50) or off. (n = 0, 48). |
| Notes: | <ul style="list-style-type: none"> • Decompression is used by ESC * 1 • Decompression used TIFF 4.0 Packbits Decompression |

ESC -

Function: Turn underline mode on/off

Code ASCII: ESC - n

Code HEX: 0x1B 0x2D n

Range: $0 \leq n \leq 2, 48 \leq n \leq 50$

Default: n = 0

Description: Turns underline mode on or off using n as follows:

| n | Function |
|-------|--|
| 0, 48 | Turns off underline mode |
| 1, 49 | Turns on underline mode (1-dot thick) |
| 2, 50 | Turns on underline mode (2-dots thick) |

Notes:

- The underline mode is effective for all characters (except for HRI characters).
- When underline mode is turned on, 90° clockwise rotated characters and white/black reverse characters cannot be underlined.
- The printer cannot underline the space set by HT, ESC \$, and ESC \.
- In Asia version (FS & (Asia version)), changing the character size does not affect the current underline thickness. Otherwise, underline thickness grows with vertical character size.
- When underline mode is turned off, the following data cannot be underlined, but the thickness is maintained.
- This command and bit 7 of ESC ! turn on and off underline mode in the same way.
- The settings of this command are effective until ESC ! is executed, ESC @ is executed, the printer is reset, or the power is turned off

ESC .**Function:** Print Advanced Raster Graphics**Code ASCII:** ESC . m n r_L r_H d1 ... dn**Code HEX:** 0x1B 0x2E m n r_L r_H d1 ... dn

Range: 0 ≤ m ≤ 72
 0 ≤ n ≤ 72
 0 ≤ r ≤ 65535
 0 ≤ d1 ... dn ≤ 255

Description: Prints a horizontal raster of graphics data one or multiple times. Horizontal offset and number of data bytes are variable and specified by parameters.
 Value of **m**: horizontal offset from left margin = 8 x **m** dots
 Value of **n**: number of data bytes that compose the raster
 Value of **r**: number of times the raster has to be printed = 256 x r_H + r_L

Notes:

- Advanced Raster graphics is not available in Page Mode.

ESC 2**Function:** Set line spacing to 1/6 inch**Code ASCII:** ESC 2**Code HEX:** 0x1B 0x32**Description:** Sets the line spacing to 1/6 inch.

Notes:

- The line spacing can be set independently in standard mode and in page mode.
- Selected line spacing is effective until ESC 3 is executed, ESC @ is executed, the printer is reset, or the power is turned off. When underline mode is turned off, the following data cannot be underlined, but the thickness is maintained.
- 1/6 inch is equivalent to 4.23 mm, which is equivalent to 34 dots.
- In contrast to this command the default line spacing is about 3.37 mm (7.52 LPI), which is equivalent to 27 dots.
- When the maximum character height exceeds 27 dots in one line, printer feeds the paper amount of height of the character when changing lines in the standard mode.
- The linespacing will be set independently from vertical motion unit (see GS P).

Reference: SYN

ESC 3

Function: Set line spacing

Code ASCII: ESC 3 n

Code HEX: 0x1B 0x33 n

Range: $0 \leq n \leq 255$

Default: Default line spacing is 3,33 mm ($n = 54$)

Description: Sets the line spacing to $n \times (\text{vertical motion unit} * 1/2)$.

- Notes:**
- The unit of n parameter is an half of a full step. It means, n will be divided by 2. $n=1$ means 0 fullsteps and the linespacing is 0.
 - The maximum line spacing is 1016 mm (40 inches). If the specified amount exceeds 1016 mm (40 inches), the line spacing is automatically set to 1016 mm (40 inches).
 - When standard mode is selected, the vertical motion unit is used.
 - When page mode is selected, the vertical or horizontal motion unit is used for the print direction set by ESC T.
 - When the starting position is set to the upper left or lower right of the printing area using ESC T, the vertical motion unit is used.
 - When the starting position is set to the upper right or lower left of the printing area using ESC T, the horizontal motion unit is used.
 - The line spacing can be set independently in standard mode and in page mode.
 - When the motion unit is changed after the line spacing is set, the line spacing setting does not change.
 - Selected line spacing is effective until ESC 2 is executed, ESC @ is executed, the printer is reset, or the power is turned off.
 - The vertical or horizontal motion unit is specified by GS P.
 - In standard mode, if the character height is greater than the line spacing specified by this command, the paper is fed the amount of the character height. For example, if a line spacing of 34 dots is specified with this command, but the characters used are double height (48 dots), the paper is fed 48 dots.
 - When an amount of paper feed exceeding the maximum value is specified, the maximum paper feed is executed.
 - The vertical motion unit (see GS P) will not calculate for line spacing.

Reference: SYN, GS P

ESC 4

Function: Read from User Data Storage

Code ASCII: ESC 4 m a0 a1 a2

Code HEX: 0x1B 0x34 m a0 a1 a2

Range: $0 \leq m \leq 255$

Description: Reads **m** bytes of data from the user data storage flash page at the address specified. Returns **m** bytes to the application, followed by a carriage return (0x0D).

The high order byte of the address (**a0**) ranges from 0 to $n2-1$, with $n2$ specified in the flash allocation command. If the flash allocation command has been used, the **a0** = 0 always.

Notes:

- If the range of requested data exceeds the sector boundary, the printer will only send the data up to the sector boundary.

ESC :

Function: Copy Character Set from ROM to RAM

Code ASCII: ESC : 0 0 0

Code HEX: 0x1B 0x3A 0x30 0x30 0x30

Default: Current active ROM Code Page

Description: Copies characters in the active ROM set to RAM. Use this command to reinitialize the User-Defined Character Set. Code Page 437 is copied by default at initialization.

Notes:

- This command is ignored if current font is the user font.
- To modify characters in one of the character set variations, such as Rotated Print, select one of the Rotated Print commands, copy to RAM, and then use the Define User-Defined Character Set command (0x1B 0x26).

ESC =

Function: Select peripheral device
Code ASCII: ESC = n
Code HEX: 0x1B 0x3D n
Range: $1 \leq n \leq 3$
Default: n = 1
Description: Selects the device to which the host computer sends data, using n as follows:

| n | Function |
|---|--|
| 1 | Enables the printer |
| 2 | Enables the customer display |
| 3 | Enables the printer and customer display |

- Notes:**
- When the printer is **disabled**, it ignores all received data and commands with the exception of ESC = and real-time commands.
 - If ASB is enabled when the printer is disabled by this command, the printer transmits the ASB status message whenever the status changes. ASB is specified by GS a.
 - Settings of this command are effective until the printer is reset, the power is turned off or ESC @ is executed (only when printer was enabled by ESC =; otherwise the command ESC @ is send only to the display),
 - After ESC @ the default value (n = 1 = printer) is selected (only when printer was enabled by ESC =; otherwise the command ESC @ is send only to the display),
 - This command is ignored if the interface card of the printer is not equipped with a customer display connector,

ESC ?

Function: Cancel user-defined characters

Code ASCII: ESC ? n

Code HEX: 0x1B 0x3F n

Range: $32 \leq n \leq 255$

Default: None

Description: Cancels the user-defined characters defined for the character code n.

- Notes:**
- After the user-defined character is cancelled, the corresponding pattern from current active ROM Code Page is printed.
 - This command is ignored if n is out of range or if the user-defined character is not defined.
 - This command can cancel user-defined characters for each font independently. To select a font, use ESC !.
 - This command can cancel user-defined characters for each memory destination independently. To select the memory destination of font, use GS “.

ESC @

Function: Initialize printer

Code ASCII: ESC @

Code HEX: 0x1B 0x40

Range: None

Default: None

Description: The data in the print buffer is cleared, and the printer mode(s) is reset to the mode that was in effect when the power was turned on.

- Any macro definitions are not cleared.
- Contents of user NV memory are not cleared.
- NV bit image is not cleared.
- Maintenance counter is not cleared.

- Notes:**
- The data in the receive buffer is not cleared.
 - When this command is processed in page mode, the printer deletes the data in the printing areas, initializes all settings, and selects standard mode.
 - This command can cancel all the settings, such as print mode and line feed, at the same time.
 - The printing position moves to the beginning of the line when this command is executed. When a left margin is set in standard mode, the position of the left margin is the beginning of the line or there is no data in the print buffer.
 - The customer display is disabled.
 - Real-time command enabled by GS (D (see page 93) is disabled.
 - Real-time command setting by command US z (see page 195) is not affected by ESC @.
 - Automatic Status Back (ASB) is switched off.
 - SRAM-User-Font-Memory will be cleared and will be default destination for user defined characters.

ESC D

Function: Set horizontal tab positions

Code ASCII: ESC D **n1 ... nk** NUL

Code HEX: 0x1B 0x44 **n1 ... nk** NUL

Range: $1 \leq n \leq 255$
 $0 \leq k \leq 32$

Default: $n = 8, 16, 24, 32, \dots$ (Every eight characters for the default font set by ESC ! or ESC M)

Description: Sets a horizontal tab to **n** columns from the beginning of the line.

- **k** indicates the number of horizontal tab positions to be set.

- Notes:**
- The horizontal tab position is stored as a value of [character width × **n**] measured from the beginning of the line. Double-width characters are selected with twice the width of normal characters. The character width should be set before using this command.
 - A maximum of 32 horizontal tab positions can be set. Data exceeding 32 horizontal tab positions is processed as normal data.
 - This command cancels any previous horizontal tab settings.
 - Transmit [**n**] **k** in ascending order and place a **NUL** code at the end. **ESC D NUL** cancels all horizontal tab positions.
 - **k** is not transmission data to the printer.
 - Even if the character width is changed after setting the horizontal tab positions, the setting of the horizontal tab positions will not be changed.
 - Horizontal tab position settings are effective until ESC @ is executed, the printer is reset, or the power is turned off.
 - Print position can be changed by HT.
 - When the left margin setting is changed, the horizontal tab position is also changed.

ESC E

Function: Turn emphasized mode on/off

Code ASCII: ESC E n

Code HEX: 0x1B 0x45 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Turns emphasized mode on or off.

- When the LSB of n is 0, emphasized mode is turned off.
- When the LSB of n is 1, emphasized mode is turned on.

- Notes:**
- The emphasized mode is effective for all characters (except for HRI characters).
 - The settings of this command are effective until ESC ! is executed, ESC @ is executed, the printer is reset, or the power is turned off.
 - The emphasized mode is not effective if smooth mode on (GS b)

ESC G

Function: Turn double-strike mode on/off

Code ASCII: ESC G n

Code HEX: 0x1B 0x47 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Turns double-strike mode on or off.

- When the LSB of n is 0, double-strike mode is turned off.
- When the LSB of n is 1, double-strike mode is turned on.

- Notes:**
- The double-strike mode is effective for all characters (except for HRI characters).
 - The settings of this command are effective until ESC ! is executed, ESC @ is executed, the printer is reset, or the power is turned off.

ESC I

Function: Turn italic print mode on/off

Code ASCII: ESC I n

Code HEX: 0x1B 0x49 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Turns italic print mode on or off.

- When the LSB of n is 0, italic print mode is turned off.
- When the LSB of n is 1, italic print mode is turned on.

- Notes:**
- The italic print mode is effective for all characters (except for HRI characters).
 - The settings of this command are effective until ESC @ is executed, the printer is reset, or the power is turned off.
 - The italic mode is not effective if smooth mode on (GS b)

ESC J

Function: Print and feed paper

Code ASCII: ESC J n

Code HEX: 0x1B 0x4A n

Range: $0 \leq n \leq 255$

Default: None

Description: Prints the data in the print buffer and feeds the paper n × (vertical or horizontal motion unit).

- Notes:**
- The maximum paper feed amount is 1016 mm (40 inches). If the specified amount exceeds 1016 mm (40 inches), the paper feed amount is automatically set to 1016 mm (40 inches).
 - When standard mode is selected, the vertical motion unit is used.
 - When page mode is selected, the vertical or horizontal motion unit is used for the print direction set by ESC T.
 - When the starting position is set to the upper left or lower right of the printing area using ESC T, the vertical motion unit is used.
 - When the starting position is set to the upper right or lower left of the printing area using ESC T, the horizontal motion unit is used.
 - After printing, the printing position moves to the beginning of the line. When a left margin is set in standard mode, the position of the left margin is the beginning of the line.
 - When this command is processed in page mode, only the printing position moves, and the printer does not perform actual printing.
 - This command is used to temporarily feed a specific length without changing the line spacing set by other commands.

- The vertical or horizontal motion unit is specified by GS P.
- In standard mode, if the character height is greater than the specified paper feed amount, the paper is fed the amount of the character height. For example, if a paper feed of 34 dots is specified with ESC J, but the character height is 40 dots, the paper is fed 40 dots.
- When an amount of paper feed that exceeds the maximum value is specified, the paper feed of the maximum amount is executed.

ESC K

Function: Select Single-Density Graphics
Code ASCII: ESC K n1 n2 d1 ... dn
Code HEX: 0x1B 0x4B n1 n2 d1 ... dn
Range: Value of n

| Value of n (8-Dot Single Density Mode) | Value of d |
|--|-------------------------|
| $n1 + (256 \times n2)$ | Number of Bytes of Data |

Description: Enters one line of 8-dot single-density graphics into the print buffer. Any print command is required to print the line, after which the printer returns to normal processing mode. Single-density mode allows 0-288 dot columns. The number of bytes sent is represented by the formulas in the table.

Notes:

- Each bit corresponds to two horizontal dots. Compare to Set Bit Image Mode (0x1B 0x2A, m=0) earlier in this document.

ESC L

Function: Select page mode

Code ASCII: ESC L

Code HEX: 0x1B 0x4C

Range: None

Default: None

Description: Switches from standard mode to page mode.

- Notes:**
- This command is only enabled when processed at the beginning of the line in standard mode. In other cases, this command is ignored.
 - The printing position is the starting position specified by ESC T within the printing area defined by ESC W.
 - The following commands switch the settings for page mode because these commands can be set independently in standard mode and in page mode:
 - ESC SP, SYN n, ESC 2 and ESC 3.
 - The following commands are disabled in page mode.
 - ESC L, GS (E and GS (L (part of functions).
 - The following commands are not effective in page mode. If these commands are processed in page mode, an internal flag is activated, and this flag is enabled when the printer returns to standard mode.
 - ESC V, ESC a, ESC {, GS L, and GS W
 - The printer returns to standard mode with ESC S, FF, and ESC @. When it returns to standard mode by ESC @, all settings are cancelled.
 - Standard mode is selected as the default.
 - In page mode, the printer prints the data in the print buffer for the printing area specified by ESC W collectively by FF or ESC FF. When executing the print and paper feed commands, such as LF, CR, ESC J, and ESC d, only the printing position moves, and the printer does not perform actual printing.

ESC R

Function: Select an international character set

Code ASCII: ESC R n

Code HEX: 0x1B 0x52 n

Description: This command is the same like ESC t (see page 74).

ESC S

Function: Select standard mode

Code ASCII: ESC S

Code HEX: 0x1B 0x53

Range: None

Default: None

Description: Switches from page mode to standard mode.

- Notes:**
- This command is enabled only in page mode. Page mode can be selected by ESC L.
 - When this command is executed, data in all the printing areas is cleared, the printing area set by ESC W returns to the default value, but the value set by ESC T is maintained.
 - The following commands switch the settings for standard mode because these commands can be set independently in standard mode and in page mode:
 - ESC SP, ESC 2 and ESC 3.
 - In standard mode, CAN, ESC FF, GS \$, and GS \ are ignored.
 - The settings of ESC T and ESC W do not affect printing in standard mode.
 - Standard mode is selected as the default.

ESC T

Function: Select print direction in page mode

Code ASCII: ESC T n

Code HEX: 0x1B 0x54 n

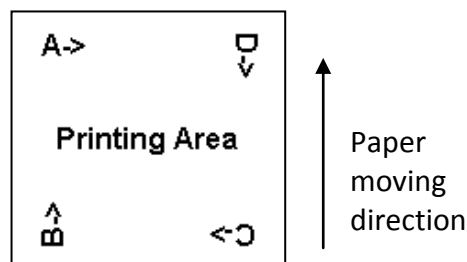
Range: $0 \leq n \leq 3$, $48 \leq n \leq 51$

Default: n = 0

Description: In page mode, selects the print direction and starting position using n as follows:

| n | Print direction | Starting position |
|-------|-----------------|-------------------------------|
| 0, 48 | Left to right | Upper left (A in the figure) |
| 1, 49 | Bottom to top | Lower left (B in the figure) |
| 2, 50 | Right to left | Lower right (C in the figure) |
| 3, 51 | Top to bottom | Upper right (D in the figure) |

Print direction A (n = 0) is the same like printing in standard mode.

**Notes:**

- The print direction set by this command is effective only in page mode.
- This command setting has no effect in standard mode. If this command is processed in standard mode, an internal flag is activated, and this flag is enabled when the printer selects page mode.
- The parameters for the horizontal or vertical motion unit differ, depending on the starting position of the printing area as follows:
 - If the starting position is the upper left or lower right of the printing area:
These commands use horizontal motion units: ESC SP, ESC \$, ESC \
 - If the starting position is the upper right or lower left of the printing area:
These commands use horizontal motion units: ESC 3, ESC J, GS \$, GS \
- The settings of this command are effective until ESC @ is executed, the printer is reset, or the power is turned off.

ESC V

Function: Turn 90° clockwise rotation mode on/off

Code ASCII: ESC V n

Code HEX: 0x1B 0x56 n

Range: $0 \leq n \leq 2, 48 \leq n \leq 50$

Default: n = 0

Description: In standard mode, turns 90° clockwise rotation mode on or off, using n as follows:

| n | Function |
|----------------|---|
| 0, 48 | Turns off 90° clockwise rotation mode. |
| 1, 49 2, 50 | Turns on 90° clockwise rotation mode (1-dot character spacing). |

- Notes:**
- The 90° clockwise rotation mode is effective for all characters (except for HRI characters) in standard mode.
 - When underline mode is turned on, the printer does not underline 90° clockwise-rotated characters.
 - When character orientation changes in 90° clockwise rotation mode, the relationship between vertical and horizontal directions is reversed.
 - The 90° clockwise rotation mode has no effect in page mode. If this command is processed in page mode, an internal flag is activated, and this flag is enabled when the printer returns to standard mode.
 - The settings of this command are effective until ESC @ is executed, ESC DC2 is executed, the printer is reset, or the power is turned off.

ESC W

| | | | | | | | | | | |
|--------------------|---|------|-------|-------|-------|-------|--------|--------|--------|--------|
| Function: | Set printing area in page mode | | | | | | | | | |
| Code ASCII: | ESC | W | x_L | x_H | y_L | y_H | dx_L | dx_H | dy_L | dy_H |
| Code HEX: | 0x1B | 0x57 | x_L | x_H | y_L | y_H | dx_L | dx_H | dy_L | dy_H |
| Range: | $0 \leq x_L, x_H, y_L, y_H, dx_L, dx_H, dy_L, dy_H \leq 255$ | | | | | | | | | |
| Default: | Horizontal logical origin and vertical logical origin = 0 $x_L = 0, x_H = 0, y_L = 0, y_H = 0$ | | | | | | | | | |

Printing area width and printing area height = entire printable area

$dx_L = 64, dx_H = 2, dy_L = 64, dy_H = 2$ (576x576 - 80 mm paper)

$dx_L = 152, dx_H = 1, dy_L = 64, dy_H = 2$ (408x576 - 57.5 mm paper)

A dimension higher as possible will be ignored.

Description: In page mode, sets the size and the logical origin of the printing area as follows:

- Horizontal logical origin = $(x_L + x_H \times 256) \times$ (horizontal motion unit) from absolute origin.
- Vertical logical origin = $(y_L + y_H \times 256) \times$ (vertical motion unit) from absolute origin.
- Printing area width = $(dx_L + dx_H \times 256) \times$ (horizontal motion unit)
- Printing area height = $(dy_L + dy_H \times 256) \times$ (vertical motion unit)

- Notes:**
- Both printing area width and height cannot be set to 0.
 - The absolute origin is the upper left of the printable area.
 - If the horizontal or vertical logical origin is set outside the printable area, this command is cancelled, and the following data is processed as normal data.
 - If [horizontal logical origin + printing area width] exceeds the printable area, the printing area width is automatically set to [horizontal printable area – horizontal logical origin].
 - If [vertical logical origin + printing area height] exceeds the printable area, the printing area height is automatically set to [vertical printable area – vertical logical origin].
 - The printing area and the logical origin set by this command are effective only in page mode.
 - This command setting has no effect in standard mode. If this command is processed in standard mode, the logical origin and the printing area are set, and they are enabled when the printer selects page mode.
 - Horizontal logical origin and printing area width are calculated using the horizontal motion unit.
 - Vertical logical origin and printing area height are calculated using the vertical motion unit.
 - Even if the horizontal or vertical motion unit is changed after changing the printable area, the setting of the printable area will not be changed.

- The settings of this command are effective until FF is executed, ESC @ is executed, the printer is reset, or the power is turned off.
- The vertical or horizontal motion unit is specified by GS P.
- See Functions 5 and 6 of GS (E for specifying the paper width.

ESC Y

Function: Select Double-Density Graphics
Code ASCII: ESC Y n1 n2 d1 ... dn
Code HEX: 0x1B 0x59 n1 n2 d1 ... dn
Range: Value of n

| Value of n (8-Dot Single Density Mode) | Value of d |
|--|-------------------------|
| $n1 + (256 \times n2)$ | Number of Bytes of Data |

Description: Enters one line of 8-dot double-density graphics into the print buffer. Any print command is required to print the line, after which the printer returns to normal processing mode. Double-density mode allows 0-576 dot columns. The number of bytes sent is represented by the formulas in the table.

Notes:

- Each bit corresponds to one horizontal dot. Compare to Set Bit Image Mode (0x1B 0x2A, m=1) earlier in this document.

ESC [! t**Function:** Set control point**Code ASCII:** ESC [! t n_L n_H **Code HEX:** 0x1B 0x5B 0x21 0x74 n_L n_H **Range:** $0 \leq (n_L + n_H * 256) \leq 0xFFFF$ **Description:** The printer sends the answer to a control point as soon as all mechanical activities are finished.

- Notes:**
- The answer which is sent to the host consists of the complete escape command (ESC [! t $n_L n_H$).
 - $(n_L + n_H * 256)$ is a value which is defined by the application program.
 - Hint: Normally the application or the software driver sends the “set control point” command after linefeed commands. However, if the “set control point” command is sent before the linefeed command, the printer also sends the control point answer before the line is printed completely.
 - Two examples with $(n_L + n_H * 256) = 0x1234$:
 Correct control point – answer to host is sent after all mechanical activities:
 A B C D E **0x0A** 0x1B 0x5B 0x21 0x74 0x34 0x12
 Wrong control point – answer to host is sent before mechanical activities are finished:
 A B C D E 0x1B 0x5B 0x21 0x74 0x34 0x12 **0x0A**.
 - In Error conditions by opening the cover or switching of the Power can be correct control points send back bad the lines are not printed.

ESC \

Function: Set relative print position

Code ASCII: ESC \ n_L n_H

Code HEX: 0x1B 0x5C n_L n_H

Range: $-32768 \leq (n_L + n_H * 256) \leq 32767$ ($0 \leq n_L \leq 255$, $-128 \leq n_H \leq 127$)

Default: None

Description: Moves the print starting position to $(n_L + n_H * 256) \times$ (horizontal or vertical motion unit) from the current position.

- Notes:**
- The printer ignores any setting that exceeds the printing area.
 - A positive number specifies movement to the right, and a negative number specifies movement to the left. N pitch movement to the right: $(n_L + n_H * 256) = N$. Use the complement of N for setting N pitch movement to the left: $(n_L + n_H * 256) = 65536 - N$.
 - When standard mode is selected, the horizontal motion unit is used.
 - When page mode is selected, the horizontal or vertical motion unit is used for the print direction set by ESC T.
 - When the starting position is set to the upper left or lower right of the printing area using ESC T, the horizontal motion unit is used.
 - When the starting position is set to the upper right or lower left of the printing area using ESC T, the vertical motion unit is used.
 - Even if the vertical or horizontal motion unit is changed after changing the printing position, the setting of the printing position will not be changed.
 - When underline mode is turned on, the underline will not be printed under the space skipped by this command.
 - The vertical or horizontal motion unit is specified by GS P.
 - After command, printer is not at start of line, independent from given value $(n_L + n_H \times 256)$

ESC a**Function:** Select justification**Code ASCII:** ESC a n**Code HEX:** 0x1B 0x61 n**Range:** $0 \leq n \leq 2, 48 \leq n \leq 50$ **Default:** n = 0**Description:** In standard mode, aligns all the data in one line to a specified position, using n as follows:

| n | Justification |
|-------|---------------------|
| 0, 48 | Left justification |
| 1, 49 | Centered |
| 2, 50 | Right justification |

Notes:

- The justification has no effect in page mode. If this command is processed in page mode, an internal flag is activated, and this flag is enabled when the printer returns to standard mode.
- This command executes justification in the printing area set by GS L and GS W.
- This command justifies printing data (such as characters, bit images, and bar codes) and space area set by HT (if received before the printed text), ESC \$, and ESC \.
- The settings of this command are effective until ESC @ is executed, the printer is reset, or the power is turned off.

ESC c 3**Function:** Select paper sensor(s) to output paper-end signals**Code ASCII:** ESC c 3 n**Code HEX:** 0x1B 0x63 0x33 n**Range:** $0 \leq n \leq 255$ **Description:** This command is ignored.

ESC c 4

Function: Select paper sensor(s) to stop printing

Code ASCII: ESC c 4 n

Code HEX: 0x1B 0x63 0x34 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Selects whether to stop printing or not when the paper runs out using n as follows:

| Bit | Function | Value | |
|-----|----------------------------|----------|---------|
| | | 0 | 1 |
| 0 | Paper roll near end sensor | Disabled | Enabled |
| 1 | Paper roll near end sensor | Disabled | Enabled |
| 2 | Undefined | - | - |
| 3 | Undefined | - | - |
| 4 | Undefined | - | - |
| 5 | Undefined | - | - |
| 6 | Undefined | - | - |
| 7 | Undefined | - | - |

Notes:

- It is possible to select multiple sensors to stop printing. When any sensor detects a paper-end, printing stops.
- The paper roll near-end sensor is enabled when either bit 0 or bit 1 is on or both are on.
- To **avoid false reports** the paper near end sensor is monitored by a 0.2 m paper feed hysteresis. That means the printer does not report paper near end to the host until 0.2 m paper is feed and all the time the paper near end sensor detects no paper! If the linefeed button is pressed within the hysteresis, the printer reports paper near end immediately.
- When a paper near-end is detected, printing stops after printing the current line and feeding the paper.
- The printer goes offline and Paper LED comes on after printing stops. To resume printing, cancel the “paper roll near-end” status by replacing the paper roll.
- If the paper roll near-end sensor is disabled and a paper near-end is detected, printing does not stop and the printer does not go offline, but the Paper LED does come on.
- The paper roll end sensor is always enabled, and when it detects a paper-end, the printer stops printing.
- When a paper roll near-end or a paper roll end is detected, the PAPER OUT LED comes on. When a paper roll end is detected, the printer performs the same operations as when a paper roll near-end is detected.
- The settings of this command are effective until ESC @ is executed, the printer is reset, or the power is turned off.

ESC c 5

Function: Enable/disable feed button

Code ASCII: ESC c 5 n

Code HEX: 0x1B 0x63 0x35 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Enables or disables the feed button.

- When the LSB of n is 0, feed button is enabled.
- When the LSB of n is 1, feed button is disabled.

- Notes:**
- The function of the feed button will only be executed when the feed button is turned on.
 - Even if the feed button is disabled by this command, paper feed button will be enabled temporarily while printer is waiting for the button to be pressed in the following states. Whether the paper can be fed or not depends on the state:
 - When the printer is waiting for the button to be pressed while GS ^ is executed (but paper cannot be fed)
To prevent problems caused by accidentally pressing the feed button, use this command to disable the button.
 - When the paper roll end sensor detects a paper end, the FEED is enabled regardless of the setting of this command. Even if the switch is pressed, paper cannot be fed.
 - When the cover is open, the FEED button is disabled regardless of the settings of this command.
 - Disabling the feed button while the button is pressed will not stop the current paper feed.

ESC d

Function: Print and feed n lines

Code ASCII: ESC d n

Code HEX: 0x1B 0x64 n

Range: $1 \leq n \leq 255$ (0 is interpreted as 1)

Default: None

Description: Prints the data in the print buffer and feeds n lines.

- Notes:**
- The amount of paper fed per line is based on the value set using the line spacing command (ESC 2 or ESC 3).
 - The maximum paper feed amount is 1016 mm (40 inches). If the specified amount exceeds 1016 mm (40 inches), the paper feed amount is automatically set to 1016 mm (40 inches).
 - After printing, the printing position moves to the beginning of the line. When a left margin is set in standard mode, the position of the left margin is the beginning of the line.
 - When this command is processed in page mode, only the printing position moves and the printer does not perform actual printing.
 - This command is used to temporarily feed a specific line without changing the line spacing set by other commands.
 - The vertical motion unit (see GS P) will not calculate for line spacing.

ESC i

Function: Full cut

Code ASCII: ESC i

Code HEX: 0x1B 0x69

Description: Cuts the receipt

- Notes:**
- There are two codes (0x19 or 0x1B 0x69) for this command and both perform the same function.
 - If not at beginning of line, a linefeed will be done
 - Wincor Nixdorf suggests using the newer command GS V (see page 157) to cut the receipt.

ESC j

Function: Read from Non-Volatile Memory

Code ASCII: ESC j k

Code HEX: 0x1B 0x6A k

Range: $20 \leq k \leq 63$ (decimal)

Description: Reads a two-byte word from location k in the history EEROM. The printer returns the word at the next available opportunity.

Notes:

- **This command is ignored.**

ESC I

Function: Start firmware upgrade mode

Code ASCII: ESC I

Code HEX: 0x1B 0x6C

Description: This command starts the firmware upgrade mode if RS232 interface is used. It is described in the following document: "WN Enhanced Serial Protocol.doc"

ESC m

Function: Partial cut

Code ASCII: ESC m

Code HEX: 0x1B 0x6D

Description: Partial cuts the receipt

Notes:

- There are two codes (0x1A or 0x1B 0x6D) for this command and both perform the same function.
- If not at beginning of line, a linefeed will be done
- Wincor Nixdorf suggests using the newer command GS V (see page 155) to cut the receipt.

ESC p

Function: Generate pulse

Code ASCII: ESC p m t1 t2

Code HEX: 0x1B 0x70 m t1 t2

Range: m = 0, 1, 48, 49
 $0 \leq t1 \leq 255$
 $0 \leq t2 \leq 255$

Default: None

Description: Outputs the pulse specified by **t1** and **t2** to the specified connector pin **m** as follows:

| m | Connector pin |
|-------|---------------------------------|
| 0, 48 | Drawer kick-out connector pin 2 |
| 1, 49 | Drawer kick-out connector pin 5 |

- The pulse for ON time is (**t1** * 2 msec) and for OFF time is (**t2** * 2 msec).

Notes:

- If **t2** < **t1**, the OFF time is equal to the ON time.

ESC r**Function:** Set current color**Code ASCII:** ESC r m**Code HEX:** 0x1B 0x72 m**Range:** m = 0, 1, 2**Default:** m = 0 (monochrome)**Description:** This command will set the current color to the color **m** for all character data that may follow this command and all graphics objects (bit images) that have not been explicitly loaded as two-color.

| m | Connector pin |
|---|---|
| 0 | monochrome - as the initial value |
| 1 | two-color paper – primary color usually black |
| 2 | second color available from two-color paper |

Notes:

- The **m** values 0 and 1 will not have a distinguishable effect; 0 is the initial value and provides parameter value consistency with other commands.
- When the monochrome paper type command (0 0) is set, this command is recognized and retained, but has no effect. The monochrome paper selection (usually black) controls the output.
- When two-color paper is loaded and the two-color paper type command set, this command will designate which of the two colors will be used for everything not specified as having an explicit color parameter(s), such as color logos, side bars, surround graphics, background watermarks or color raster graphics. The effect mimics shifting a two-color ribbon in a printer or typewriter to type the color of the lower half ribbon.
- After a power loss or reset the default value **m** = 0 is set.

ESC s**Function:** Write to Non-Volatile Memory (NVRAM)**Code ASCII:** ESC s n1 n2 k**Code HEX:** 0x1B 0x73 n1 n2 k

Range: n1 = 1st Byte
 n2 = 2nd Byte
 $20 \leq k \leq 63$ (decimal locations)

Description: Writes the two-byte word, **n1 n2**, to location **k** in history EEROM.**Notes:**

- This command is **ignored!**

ESC t

Function: Select character code table

Code ASCII: ESC t n

Code HEX: 0x1B 0x74 n

Range: $0 \leq n \leq 29$

Default: n = 0

Description: Selects a page n from the character code table as follows:

| n | Character code table |
|----|-------------------------------|
| 0 | PC437 (USA, Standard Europe) |
| 1 | PC850 (Multilingual Latin I) |
| 2 | PC852 (Latin II) |
| 3 | PC860 (Portuguese) |
| 4 | PC863 (Canadian French) |
| 5 | PC865 (Nordic) |
| 6 | PC858 (Multilingual I + Euro) |
| 7 | PC866 (Russian) |
| 8 | PC1252 (Latin I) |
| 9 | PC862 (Hebrew) |
| 10 | PC737 (Greek) |
| 11 | PC874 (Thai) |
| 12 | PC857 (Turkish) |
| 16 | WPC1254 (Turkish) |
| 17 | WPC1250 (Central Europe) |
| 18 | WPC28591 (Latin 1) |
| 19 | WPC28592 (Latin 2) |
| 20 | WPC28599 (Turkish) |
| 21 | WPC28605 (Latin 9) |
| 22 | PC864 (Arabic) |
| 23 | PC720 (Arabic) |
| 24 | WPC1256 (Arabic) |
| 25 | WPC28596 (Arabic) |
| 26 | KATAKANA (Asia) |
| 27 | PC775 (Baltic) |
| 28 | WPC1257 (Baltic) |
| 29 | WPC28594 (Baltic) |

Notes:

- There are two codes for this command (See “Select international character code, 0x1B 0x52 n). Both codes perform the same function.
- The alphanumeric characters (0x20 (decimal 32) to 0x7F (decimal 127)) are the same for each page. The extended characters (0x80 (decimal 128) to 0xFF (decimal 255)) are different for each page.
- The selected character code table is effective until ESC @ is executed, the printer is reset, or the power is turned off.

ESC u**Function:** Transmit Peripheral Device Status**Code ASCII:** ESC u 0**Code HEX:** 0x1B 0x75 0x00**Description:** Transmits 1 byte of peripheral device status data as follows:

| Status Byte | | | |
|-------------|---------------------------------|-----|------|
| Bit | Function | 0 | 1 |
| 0 | Drawer kick-out connector pin 3 | Low | High |
| 1 | Drawer kick-out connector pin 3 | Low | High |
| 2 | Undefined | | |
| 3 | Undefined | | |
| 4 | Undefined | | |
| 5 | Undefined | | |
| 6 | Undefined | | |
| 7 | Undefined | | |

Notes:

- The printer sends one byte to the host computer when it is not busy or in a fault condition. In DTS/DSR protocol, the printer waits for DSR = SPACE.
- If no cash drawer is connected, the status will indicate »High«.

ESC v

Function: Transmit paper sensor status
Code ASCII: ESC v
Code HEX: 0x1B 0x76
Description: Transmits 1 byte of paper sensor status data as follows:

| Status Byte | | | |
|-------------|-----------------------|----------------|---------------------|
| Bit | Function | 0 | 1 |
| 0 | Paper near end sensor | Paper present | No paper |
| 1 | Cover | Closed | Open |
| 2 | Paper end sensor | Paper present | No paper |
| 3 | Cutter error | No error | Error occurred |
| 4 | Not Used | Fixed to Zero | Fixed to Zero |
| 5 | Temperature | In valid range | Too hot or too cold |
| 6 | Voltage | In valid range | Too high or too low |
| 7 | Not Used | Fixed to Zero | Fixed to Zero |

- Notes:**
- The printer sends one byte to the host computer when it is not busy or in a fault condition. In DTS/DSR protocol, the printer waits for DSR = SPACE.
 - If the Memory Switch to suppress the Paper-Near-End Notification is enabled (see GS (E pL pH fn [a1 b18...b11]...[ak nk8 nk1] <Function 3>), the state of Bit 0 is fixed to Zero

ESC w n 7**Function:** Receipt shooting flush**Code ASCII:** ESC w n 7 n**Code HEX:** 0x1B 0x77 0x6E 0x37 n**Range:** n = 0, 1, 48, 49**Description:** The Receipt shooting spooler is flushed with or without printer synchronization and the printer sends 1 byte back to the host after execution.

- n specifies the function.

| n | Function |
|-------|--|
| 0, 48 | Receipt shooting flush without printer synchronize |
| 1, 49 | Receipt shooting flush with printer synchronize |

Notes:

- The answer byte is fixed to 0x19.
 - If the value of n is out of the specified range, this command is ignored.
 - Receipt shooting flushing is executed only if Receipt shooting was enabled by memory switch 128-5 (command GS (E).
 - Printing of barcode PDF417 will stopped the printout for a short time (see GS k)
- Wincor Nixdorf specific function

ESC w n 8**Function:** Play melody from flash**Code ASCII:** ESC w n 8 n m**Code HEX:** 0x1B 0x77 0x6E 0x38 n m**Range:** 1 <= n <= 255
0 <= m <= 1**Description:** The Printer play the melody from flash specified with parameter n. If the number of melodies in the flash smaller n, the command is ignored. Parameter m is the synchronism flag. Is m not 0, the printer waits for finish melody.**Notes:** Wincor Nixdorf specific function

ESC w n b

Function: Special Wincor barcode parameter

Code ASCII: ESC w n b n d₁ .. d_k

Code HEX: 0x1B 0x77 0x6E 0x62 n

Range: n = 16, 79

Description:

- n specifies the function.
- k specifies the count of following bytes

| n | Bar code system | Number of characters | Characters | Function |
|--------|----------------------|----------------------|------------|---|
| 16, 79 | GS1 Databar Expanded | k = 1 | 0~9 | <p>Specifies the count of Data-Segments in one Line. Contains the barcode more Segments, the barcode will be wrapped.</p> <p>If the expand code used with composite code, 4 segments are the minimum. Less than 4 segments, the barcode will not printed.</p> <p>Count of segments has to be even. Otherwise setting will be discard.</p> <p>If barcode with set segments to wide for print area, barcode will not print.</p> |

Notes: Wincor Nixdorf specific function. OLD COMMAND. Use GS (k pL pH cn fn (cn = 51, fn = 72) instead. COMMAND will not supported in further releases

ESC w n c

Function: Switch the printer into Sleep-Mode.

Code ASCII: ESC w n c

Code HEX: 0x1B 0x77 0x6E 0x63

Description: This function immediately starts the Sleep-Mode of the printer when the memory switch 128-3 is enabled.

Notes: Wincor Nixdorf specific function

ESC {

Function: Turn upside-down printing mode on/off

Code ASCII: ESC { n

Code HEX: 0x1B 0x7B n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: In standard mode, turns upside-down printing mode on or off.

- When the LSB of n is 0, upside-down printing mode is turned off.
- When the LSB of n is 1, upside-down printing mode is turned on.

- Notes:**
- When standard mode is selected, this command is enabled only when processed at the beginning of the line.
 - The upside-down printing mode is effective for all data in standard mode.
 - The upside-down printing mode has no effect in page mode. If this command is processed in page mode, an internal flag is activated, and this flag is enabled when the printer returns to standard mode.
 - The settings of this command are effective until ESC @ is executed, the printer is reset, or the power is turned off.
 - When upside-down printing mode is turned on, the printer prints 180°-rotated characters from right to left. The line printing order is not reversed; therefore, be careful of the order of the data transmitted.

ESC w n _get_last_error

FUNCTION: Returns the last occurred error.

Code ASCII: ESC w n _get_last_error NULL

Code HEXGS 0x1B 0x77 0x6E 0x5F 0x67 0x65 0x74 0x5F 0x6C 0x61 0x73 0x74 0x5F 0x65
(: 0x72 0x72 0x6F 0x72 0x00

Description: This function returns the last occurred error.

Notes: The printer transmits the “Header to NUL” data shown below:

| Transmit data | Hex | Decimal | Description | Data quantity |
|---------------|------|---------|-------------------------|---------------|
| Header | 0x37 | 55 | | 1 byte |
| Identifier 1 | 0x77 | 119 | | 1 byte |
| Identifier 2 | 0x6E | 110 | | 1 byte |
| Last error | 0x00 | 0 | No error | 1 byte |
| | 0x01 | 1 | Byte allocation failure | 1 byte |
| | 0x02 | 2 | QR Encoding failure | 1 byte |
| | 0x03 | 3 | Not at start of line | 1 byte |
| | 0x04 | 4 | No error | 1 byte |
| NULL | 0x00 | 0 | | 1 byte |

- Wincor Nixdorf specific function
TH230 + only. **Firmware 01.07 or newer**
- Last error mechanism works at time with following command:
GS (k pL pH cn fn m (cn = 49, fn = 81)
Command returns the last error until a new error occurred or the error is reset by ESC w n _ r e s e t _ s y s _ e r r o r

ESC w n _ r e s e t _ s y s _ e r r o r

FUNCTION: Reset last error.

Code ASCII: ESC w n _ r e s e t _ s y s _ e r r o r *NULL*

Code HEX: 0x1B 0x77 0x6E 0x5F 0x72 0x65 0x72 0x65 0x74 0x5F 0x73 0x79 0x73 0x5F 0x65 0x72 0x72 0x6F 0x72 0x00

Description: This function resets the last error that has occurred.

Notes: Wincor Nixdorf specific function.

TH230 + only. **Firmware 01.07 or newer**

Get the last error with ESC w n _ g e t _ l a s t _ e r r o r .

After excution this command ESC w n _ g e t _ l a s t _ e r r o r will send "No error"

FS ! (Asia version)

Function: Select print mode(s) for Kanji characters
Code ASCII: FS ! n
Code HEX: 0x1C 0x21 n
Description: Selects the character styles (double-height, double-width, and Kanji-underlined) together for multi-byte code character as follows:

| Bit | Function | Value | |
|-----|----------------------|----------|---------|
| | | 0 | 1 |
| 0 | Reserved | | |
| 1 | Reserved | | |
| 2 | Double-width mode | Disabled | Enabled |
| 3 | Double-height mode | Disabled | Enabled |
| 4 | Reserved | | |
| 5 | Reserved | | |
| 6 | Reserved | | |
| 7 | Kanji-underline mode | Disabled | Enabled |

- Notes:**
- If the ASIA character module is not loaded then this command is ignored.
 - The ASIA character set module can only be loaded in the Asia version of **TH230**. The Controller of this version is equipped with at least 4 MByte Flash Memory.

FS & (Asia version)

Function: Select Kanji character mode
Code ASCII: FS &
Code HEX: 0x1C 0x26
Description: This command enable the ASIA character set (multi-byte code).

- Notes:**
- If the ASIA character module is not loaded then this command is ignored.
 - The ASIA character set module can only be loaded in the Asia version of **TH230**. The Controller of this version is equipped with at least 4 MByte Flash Memory.

FS - (Asia version)

Function: Turn underline mode on/off for Kanji characters
Code ASCII: FS - n
Code HEX: 0x1C 0x2D n
Range: $1 \leq n \leq 2, 48 \leq n \leq 51$
Default: n = 0
Description: Turns on or off underline mode for multi-byte code character(Kanji-underline) as follows:

| n | Function |
|-------|--|
| 0, 48 | Turns off Kanji-underline mode. |
| 1, 49 | Turns on Kanji-underline mode, set at 1-dot width. |
| 2, 50 | Turns on Kanji-underline mode, set at 2-dot width. |

- Notes:**
- If the ASIA character module is not loaded then this command is ignored.
 - The ASIA character set module can only be loaded in the Asia version of **TH230**. The Controller of this version is equipped with at least 4 MByte Flash Memory.

FS . (Asia version)

Function: Cancel Kanji character mode
Code ASCII: FS .
Code HEX: 0x1C 0x2E
Description: This command disable the ASIA character set (multi-byte code).

- Notes:**
- If the ASIA character module is not loaded then this command is ignored.
 - The ASIA character set module can only be loaded in the Asia version of **TH230**. The Controller of this version is equipped with at least 4 MByte Flash Memory.

FS 2 (Asia version)

Function: Define user-defined Kanji characters
Code ASCII: FS 2 c1 c2 d1...dk
Code HEX: 0x1C 0x32 c1 c2 d1...dk
Range: The ranges of **c1** and **c2** differ, depending on the character code system used.

| Character set | Hexadecimal | |
|---------------------------------------|----------------|--|
| | c1 | c2 |
| Japanese (JIS code) | c1 = 77 | $21 \leq \mathbf{c2} \leq 7E$ |
| Japanese (SHIFT JIS code) | c1 = EC | $40 \leq \mathbf{c2} \leq 7E$ $80 \leq \mathbf{c2} \leq 9E$ |
| Simplified Chinese (GB2312) Korean | c1 = FE | $A1 \leq \mathbf{c2} \leq FE$ |

$0 \leq \mathbf{d} \leq 255$

K = 72

Description: Defines the user-defined Kanji character pattern (**d1...dk**) specified by the character codes (**c1** and **c2**).

Notes:

- If the ASIA character module is not loaded then this command is ignored.
- The ASIA character set module can only be loaded in the Asia version of **TH230**. The Controller of this version is equipped with at least 4 MByte Flash Memory.
- User-defined Kanji characters are not activated in BIG5-character-set at time

FS C (Asia version)

Function: Select Kanji character code system

Code ASCII: FS C n

Code HEX: 0x1C 0x43 n

Range: n = 0, 1, 48, 49

Default: n = 0

Description: Selects a Kanji character code system for the Japanese model as follows:

| Bit | Kanji character code system |
|-------|-----------------------------|
| 0, 48 | JIS code |
| 1, 49 | SHIFT JIS code |

Notes:

- If the ASIA character module is not loaded then this command is ignored.
- The ASIA character set module can only be loaded in the Asia version of **TH230**. The Controller of this version is equipped with at least 4 MByte Flash Memory.

FS S (Asia version)

Function: Set Kanji character spacing

Code ASCII: FS S n1 n2

Code HEX: 0x1C 0x53 n1 n2

Range: $0 \leq n1 \leq 255$
 $0 \leq n2 \leq 255$

Default: n1 = 0, n2 = 0

Description: Sets the left-side character spacing of the multi-byte code character to [n1 (horizontal or vertical motion unit)]; sets the right-side character spacing of the multi-byte code character to [n2 (horizontal or vertical motion unit)].

Notes:

- The maximum of the left- and the right-side character spacing is 255 dots, depending on setted resolution (see GS P)
- If the ASIA character module is not loaded then this command is ignored.
- The ASIA character set module can only be loaded in the Asia version of **TH230**. The Controller of this version is equipped with at least 4 MByte Flash Memory.

FS W (Asia version)

| | |
|---------------------|---|
| Function: | Turn quadruple-size mode on/off for Kanji characters |
| Code ASCII: | FS W n |
| Code HEX: | 0x1C 0x57 n |
| Range: | $0 \leq n \leq 255$ |
| Default: | n = 0 |
| Description: | Turns quadruple-size mode on or off for multi-byte code character. <ul style="list-style-type: none"> • When the LSB of n is 0, quadruple-size mode is turned off. • When the LSB of n is 1, quadruple-size mode is turned on. |
| Notes: | <ul style="list-style-type: none"> • If the ASIA character module is not loaded then this command is ignored. • The ASIA character set module can only be loaded in the Asia version of TH230. The Controller of this version is equipped with at least 4 MByte Flash Memory. |

GS ETX

| | |
|---------------------|---|
| Function: | Real time request to printer |
| Code ASCII: | GS ETX n |
| Code HEX: | 0x1D 0x03 n |
| Range: | $1 \leq n \leq 2$ |
| Description: | This command is identical to command DLE ENQ (see page 29). |

GS EOT

| | |
|---------------------|---|
| Function: | Real time status transmission |
| Code ASCII: | GS EOT n |
| Code HEX: | 0x1D 0x04 n |
| Range: | $1 \leq n \leq 4$ |
| Description: | This command is identical to command DLE EOT (see page 26). |

GS ENQ

Function: Real time printer status transmission
Code ASCII: GS ENQ
Code HEX: 0x1D 0x05
Description: Transmits one byte status of the printer in real time.

| Status Byte | | | |
|-------------|---------------------------------|-------------|---|
| Bit | Function | 0 Signifies | 1 Signifies |
| 0 | Paper | Present | Low (only if paper low sensor is enabled) |
| 1 | Paper | Present | Low (only if paper low sensor is enabled) |
| 2 | Cover | Closed | Open |
| 3 | Busy | Not Busy | Busy |
| 4 | Drawer kick-out connector pin 3 | Low | High |
| 5 | Not used | Fixed to 0 | |
| 6 | Error | No error | Error occurred |
| 7 | Not used | Fixed to 1 | |

Bit 3: Busy is set when the printer enters the Offline State (see chapter [Online / Offline State Diagram](#)) or if the receive buffer is nearly full.

Bit 6: Error means Cover open, Paper out, Black mark error, Cutter error, Thermistor error, High voltage error or Low voltage error. Thermistor error is an unrecoverable error. High voltage error and Low voltage error are automatic recoverable errors!

- Notes:**
- When transmitting block data (Header ~ NUL), the status will be sent after that.
 - This command can be disabled by US z (page 195).
 - The printer executes this command even when it is in offline or error status.
 - If the receive buffer is full the execution depends from Memory Switch 2-8 (Listen to Real-Time-Commands - see command GS (E).
 - If Memory Switch 2-8 is set to off (48): command is executed.
 - If Memory Switch 2-8 is set to on (49): command is not executed.

GS !

Function: Select character size

Code ASCII: GS ! n

Code HEX: 0x1D 0x21 n

Range: $0 \leq n \leq 7$, $16 \leq n \leq 23$, $32 \leq n \leq 39$, $48 \leq n \leq 55$,
 $64 \leq n \leq 71$, $80 \leq n \leq 87$, $96 \leq n \leq 103$, $112 \leq n \leq 119$
 ($1 \leq \text{width} \leq 8$, $1 \leq \text{height} \leq 8$)

Default: n = 0

Description: Selects the character height (vertical number of times normal font size) using bits 0 to 2 and selects the character width (horizontal number of times normal font size) using bits 4 to 6, as follows:

| Character width selection | | | | | |
|----------------------------|-------|-------|-----|---------|-------------------|
| Bit 6 | Bit 5 | Bit 4 | Hex | Decimal | Width |
| Off | Off | Off | 00 | 0 | 1 (normal) |
| Off | Off | On | 10 | 16 | 2 (double width) |
| Off | On | Off | 20 | 32 | 3 |
| Off | On | On | 30 | 48 | 4 |
| On | Off | Off | 40 | 64 | 5 |
| On | Off | On | 50 | 80 | 6 |
| On | On | Off | 60 | 96 | 7 |
| On | On | On | 70 | 112 | 8 |
| Character height selection | | | | | |
| Bit 2 | Bit 1 | Bit 0 | Hex | Decimal | Height |
| Off | Off | Off | 00 | 0 | 1 (normal) |
| Off | Off | On | 01 | 1 | 2 (double height) |
| Off | On | Off | 02 | 2 | 3 |
| Off | On | On | 03 | 3 | 4 |
| On | Off | Off | 04 | 4 | 5 |
| On | Off | On | 05 | 5 | 6 |
| On | On | Off | 06 | 6 | 7 |
| On | On | On | 07 | 7 | 8 |

Notes:

- The character size set by this command is effective for all characters (except for HRI characters).
- When the characters are enlarged with different heights on one line, all the characters on the line are aligned at the baseline.
- When the characters are enlarged width wise, the characters are enlarged to the right, based on the left side of the character.
- ESC ! can also turn double-width and double-height modes on or off. That means it overwrites the settings of GS !.

- DC2 (see page 31) and DC3 (see page 32) also turn double-width modes On or Off. That means they overwrite the settings of GS !
- In standard mode, the character is enlarged in the paper feed direction when double-height mode is selected, and it is enlarged perpendicular to the paper feed direction when double-width mode is selected. However, when character orientation changes in 90° clockwise-rotated mode, the relationship between height and width is reversed.
- In page mode, double-height and double-width are on the character orientation.
- The setting of character size is effective until ESC ! is executed, ESC @ is executed, the printer is reset, or the power is turned off.

GS “

Function: Select memory type (SRAM/Flash)

Code ASCII: GS “ n

Code HEX: 0x1D 0x22 n

Range: $48 \leq n \leq 51$

Description: Where to Save Logos or User-Defined Fonts

n = 48 (ASCII n = 0)

Loads active logo to RAM only. This is used to print a special logo but not have it take up Flash Memory. A logo defined following this command is not preserved over a power cycle.

n = 49 (ASCII n = 1)

Loads active logo to Flash Memory. This is the default condition for logo Flash storage. A logo defined following this command is stored in Flash Memory.

n = 50 (ASCII n = 2)

Loads user-defined characters to RAM only. This is the default condition for user-defined character storage. Any user-defined characters defined following this command are not preserved over a power cycle.

n = 51 (ASCII n = 3)

Loads user-defined characters to Flash Memory. An application must use this command to store user-defined characters in Flash Memory. Any user-defined characters defined following this command are stored in Flash Memory. A user-defined character cannot be redefined in Flash Memory. The Flash Memory page must be erased by an application before redefining user-defined characters. For more information, see the Erase User Flash Sector (GS @ n) command.

Notes:

- Specifies whether to load the logos or user-defined characters to Flash Memory or to RAM (volatile memory). The selection remains in effect until it is changed via this command or until the power cycles.
- Additionally the selection n= 51 remains in effect until ESC @ is received. ESC @ will reset this setting to n=50.

GS " U

Function: Flash Memory User Sectors Allocation

Code ASCII: GS " U n1 n2

Code HEX: 0x1D 0x22 0x55 n1 n2

Range: $0 \leq n1 \leq 8$

$0 \leq n2 \leq 8$

$n1 + n2 \leq 8$ is equivalent to 512k user memory

Description: n1 is the number of 64k sectors used for logos and user-defined characters.
n2 is the number of 64k sectors used for user data storage.

This command sets the allocation of flash sectors among user data storage, logos/user-defined characters, and electronic journal. This allocation is saved in the EEPROM of the printer and is therefore saved across power cycles.

The printer will respond to the flash allocation command being sending ACK (0x06) or NAK (0x15).

$n1 + n2 \leq 8$ is equivalent to 512k user memory

- Notes:**
- Flash memory is made up of user and program code. Therefore, the available flash memory space will vary with the amount of program code utilized.
 - If $n1 + n2$ is greater than the maximum number of sectors available, the command is ignored and the printer responds with NAK (0x15).
 - Issuing this command with parameters different from current parameters will erase all sectors.
 - The logo/user-defined character memory and the user data storage shared the 512K user memory with some header data. Follow sizes have to subtract from the 512K:
 - 1K Flash info
 - 4 Byte partition header logo/user-defined character memory
 - 4 Byte partition header user data storage
 - If $n1$ or $n2 = 0$ the minimal size of partition header will be left
 - If $n1$ and $n2 = 0$ the command will be ignored

GS

Function: Select the Current Logo

Code ASCII: GS # n

Code HEX: 0x1D 0x23 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Selects a color or monochrome logo to be defined or printed. The active logo **n** remains in use until this command is sent again with a different logo **n**.

When this command precedes a logo definition, that definition is stored in Flash Memory as logo **n**.

When this command precedes a logo print command and **n** is different from the previously active logo selected, the printer retrieves the logo definition for **n** from Flash Memory and prints it. If there is no definition for logo **n**, then no logo is printed.

In the case of a previously existing application that expects only one possible logo, the printer will not receive the Select Current Logo (0x1D 0x23 n) command. In this case, the printer assigns 0 as the active logo identifier. It automatically stores any new logo definition in Flash Memory as logo 0, inactivating any previous logo 0 definitions. If the Flash Memory space available for logos fills up with inactive logo 0 definitions, the firmware erases the old definitions at the next power cycle. This is the only case in which the printer erases Flash Memory without an application command.

In the case of a new application using multiple logos, the Select Current Logo (0x1D 0x23 n) command is used. After that, the printer no longer automatically erases the logo definition Flash Memory page when it fills with multiple definitions. A new application using multiple logos, writing a user-defined character set into Flash Memory, or both, is responsible for erasing the logo and user-defined character set Flash Memory page when the logo area is full or before a new character set is defined.

GS \$

Function: Set absolute vertical print position in page mode

Code ASCII: GS \$ n_L n_H

Code HEX: 0x1D 0x24 n_L n_H

Range: $0 \leq n_L \leq 255, 0 \leq n_H \leq 255$

Default: None

Description: In page mode, sets the vertical printing position to $(n_L + n_H \times 256) \times$ (vertical or horizontal motion unit) from the starting position set by ESC T.

- Notes:**
- This command is enabled only in page mode. If this command is processed in standard mode, it is ignored.
 - The printer ignores any setting that exceeds the printing area set by ESC W.
 - The horizontal or vertical motion unit is used for the print direction set by ESC T.
 - When the starting position is set to the upper left or lower right of the printing area using ESC T, the vertical motion unit is used.
 - When the starting position is set to the upper right or lower left of the printing area using ESC T, the horizontal motion unit is used.
 - Even if the vertical or horizontal motion unit is changed after changing the printing position, the printing position will not be changed.
 - The vertical or horizontal motion unit is specified by GS P.

GS (A

Function: Executes test and diagnosis functions

Code ASCII: GS (A p_L p_H n m

Code HEX: 0x1D 0x28 0x41 p_L p_H n m

Range: $(p_L + (p_H \times 256)) = 2$ (where $p_L = 2$, $p_H = 0$)
 $0 \leq n \leq 255$
 $m = 1, 2, 6, 49, 50, 54$

Default:

Description: This command executes test and diagnosis functions. The function is specified by **m**.

- **p_L , p_H** specifies $(p_L + (p_H \times 256))$ for the number of bytes after **p_H** (**n** and **m**).
- **n** is just for command compatibility and will be ignored. The parameter is a dummy for further extensions. That is why, printer accept all values, but don't use anyone of them.
- **m** specifies the test function.

| m | Function |
|-------|--|
| 1, 49 | Enter the hexadecimal dump for the communication interface |
| 2, 50 | Print the extended selftest form |
| 6, 54 | Print a sample print |

- This command is effective only when processed at the beginning of the line.
- When processing the hexadecimal dump ($m = 1, 49$) the printer stays in this test until the printer is switched off.
- When processing the hexadecimal dump ($m = 1, 49$) the test button is ignored.
- The extended selftest form is the same like started by (us t) command with additional statistic data (see 0.).
- When print test form and print sample the actual print will be changed.
- This command is disabled in Page Mode.
- While processing the extended selftest ($m=2$) and sample print ($m=6$), it is recommended to wait sending next print data until the actual job is finished.

GS (D

Function: Enable/disable real-time command

Code ASCII: GS (D p_L p_H m [a1 b1]...[ak bk]

Code HEX: 0x1D 0x28 0x44 p_L p_H 0x14 [a1 b1]...[ak bk]

Range: ($p_L + p_H \times 256$) = 3 ($p_L = 3$, $p_H = 0$)
 $m = 20$

$a = 2$

$b = 0, 1, 48, 49$

Default: $a = 2$ / $b = 0$ (DLE SO fn a b ($n = 2$): disable)

Description: Specifies enable or disable of a real-time command.

- p_L , p_H sets the number of parameters after p_H (m and [a1 b1]...[ak bk]) to ($p_L + p_H \times 256$) bytes.
- a specifies the type of real-time command.
- b specifies enable/disable of real-time command processing.

| a | b | Real-time command type |
|---|-------|--|
| 2 | 0, 48 | Disable DLE SO n a b ($n = 2$): execute power off (It doesn't process) |
| | 1, 49 | Enable DLE SO n a b ($n = 2$): execute power off (It does process) |

Notes:

- You will find additional information about "Power off control by host" on page 9.
- The behavior of the Power Button is described on page 7.
- The printer processes each real-time command that is enabled upon receiving it.
- A real-time command specified as disabled is not processed.
- The setting of this command is effective until ESC @ is executed, the printer is reset, or the power is turned off.
- If you transmit a command for a bit image or defined data that contains the sequence DLE SO, be sure to disable real-time command processing before transmitting the bit image or defined data command. Then the printer will process the sequence DLE SO as image data.

GS (E

Function: User setup commands

Code ASCII: GS (E p_L p_H fn parameters

Code HEX: 0x1D 0x28 0x45 p_L p_H fn parameters

Description: Controls the user setting modes. The table below explains the functions available in this command.

- The value of **fn** specifies the function.

| fn | Function | Description |
|-----|------------------------------|--|
| 1 | Function 1 | Changes into the user setting mode. |
| 2 | Function 2 | Ends user setting mode session. (Performs a software reset.) |
| 3 | Function 3 | Changes the memory switch. |
| 4 | Function 4 | Transmits the host the value for the memory switch. |
| 5 | Function 5 | Changes the customized setting values. |
| 6 | Function 6 | Transmits the customized setting values. |
| 11 | Function 11 | Sets communication condition of serial interface. |
| 12 | Function 12 | Transmits communication condition of serial interface. |
| 129 | Function 129 | Set serial number |
| 130 | Function 130 | Set production date |
| 131 | Function 131 | Sets communication condition of Ethernet interface |
| 132 | Function 132 | Transmits communication condition of Ethernet interface |

- p_L and p_H specify the number of bytes for the parameters following p_H (fn and [a1 b1] ... [ak bk]) as (p_L + (p_H × 256)).
- The other parameters are explained under the respective functions.

Notes:

- The value of parameter **fn** determines the function number for this command. Command operation differs, depending on the function number.

- The value defined by the user setting mode is effective until redefined by this mode again. It is not initialized by turning off the power or executing ESC @.
User setting mode is a special mode to change settings for the printer's built-in non-volatile memory.
- To change a setting, you must change the printer into user setting mode, using Function 1.
- The setting you specify is activated by transmitting a Function 2 command upon completion of making the setting.
- Note the rules below for the user setting mode:
 - The printer does not process character data.
 - The printer does not process commands other than this command and the GS I command.
 - The printer ignores real-time commands.
 - The printer does not transmit ASB status.
- Functions 4, 6, 12, and 50, the functions used to transmit the current settings to the host, can be used at any time, without changing into the user setting mode.
- Data is written to the non-volatile memory by Functions 3, 5, 7, 11, 48, and 49. Note the following when using those functions:
 - The printer might be BUSY. In this case, be sure not to transmit a command from the host because the printer will not receive the data.
 - Excessive use of this function may destroy the non-volatile memory. As a guideline, do not use any combination of the following commands more than 10 times per day for writing data to the non-volatile memory: FS q, GS (E (part of functions), GS (L (part of functions), GS g 0, and FS g 1.
- Notes for the processing to transmit data:
 - Data is transmitted by Functions 1, 4, 6, 12, and 50.
 - The printer goes BUSY immediately before transmitting the header, and it returns to READY after transmitting NUL. (This excludes situations when the printer is BUSY for other reasons.)
 - You cannot use ASB status and real-time commands while "Header to NUL" data is being transmitted.
 - With a serial interface printer, be sure to use this function when the host can receive data.
 - With a parallel interface printer, data transmitted (excluding ASB status) with this command ("Header to NUL") is temporarily stored in the printer transmit buffer, as with other data. When the host goes into reverse mode, the printer then transmits the data sequentially from the beginning of the transmit buffer. Transmit buffer capacity is 99 bytes. Data exceeding this amount is lost. Therefore, when using this command, promptly change into reverse mode to start the data receive process.

GS (E p_L p_H fn d1 d2 <Function 1>

Code ASCII: GS (E p_L p_H fn d1 d2
Code HEX: 0x1D 0x28 0x45 0x03 0x00 0x01 0x49 0x4E
Range: (p_L + p_H × 256) = 3 (p_L = 3, p_H = 0)
 fn = 1
 d1 = 73 = 'I'
 d2 = 78 = 'N'

Description: This command changes the printer into the user setting mode.

- Notes:**
- If the printer is in standard mode, this command is valid only at the beginning of the line.
 - If the printer is in page mode, this command is ignored.
 - Do not use this command while defining macros, because macros cannot be included with this command.
 - When the printer goes into the user setting mode, it transmits a “mode change notice” back to the host.

| Transmit data | Hex | Decimal | Data quantity |
|---------------|------|---------|---------------|
| Header | 0x37 | 55 | 1 byte |
| Identifier | 0x20 | 32 | 1 byte |
| NULL | 0x00 | 0 | 1 byte |

- When it has executed this function, send the next commands after checking the “mode change notice”.
- The host can differentiate the “mode change notice” from other data the printer transmits by the specific information in the transmit data block. When the header transmitted from the printer is 0x37 or 55 decimal, the data up to NUL (0x00 or 0 decimal) is handled as one group and can be identified using the following data:

| Transmit data | Hex | Decimal |
|-----------------------|------|---------|
| 1st byte (header) | 0x37 | 55 |
| 2nd byte (identifier) | 0x20 | 32 |

However, consider the following requirement for data processing:

- When communication with the printer uses XON/XOFF control, the XOFF code may interrupt the “Header to NUL” data string.

GS (E p_L p_H fn d1 d2 d3 <Function 2>

| | | | | | | | | | |
|--------------------|--|------|------|----------------|----------------|------|------|------|------|
| Code ASCII: | GS | (| E | p _L | p _H | fn | d1 | d2 | d3 |
| Code HEX: | 0x1D | 0x28 | 0x45 | 0x04 | 0x00 | 0x02 | 0x4F | 0x55 | 0x54 |
| Range: | $(p_L + p_H \times 256) = 4$ ($p_L = 4, p_H = 0$) $fn = 2$ $d1 = 79 = 'O'$ $d2 = 85 = 'U'$ $d3 = 84 = 'T'$ | | | | | | | | |

Description: Ends the user setting mode and the printer performs software reset.

Notes:

- This function is performed only when the printer is in user setting mode.
- After the software reset, the printer goes into the power on state.
- Executing this function enables setting values set in user setting mode (such as memory switch or customize value).
- Be sure to execute this function after changing all the setting values.
- **Be sure to readout the transmit buffer of the printer before sending this command.** This ensures that the data of the “mode change notice” (see command GS (E <Function 1>) and possibly ASB messages are transmitted before the printer executes the software reset.

GS (E p_L p_H fn [a1 b1₈...b1₁]...[ak nk₈ nk₁] <Function 3>

Code ASCII: GS (E p_L p_H fn [a1 b1₈...b1₁]...[ak nk₈ nk₁]

Code HEX: 0x1D 0x28 0x45 p_L p_H 0x03 [a1 b1₈...b1₁]...[ak nk₈ nk₁]

Range: $10 \leq (p_L + p_H \times 256) \leq 65530$ ($0 \leq p_L \leq 255, 0 \leq p_H \leq 255$;

$(p_L + p_H \times 256) = 9 \times k + 1$)

fn = 3

b = 48, 49, 50

a = 1, 2, 128

Default: All Memory switches are OFF (**b** = 48) except for Sleep-Mode (128-3)(**b** = 49).

Description: Changes the memory switch specified by **a** to the value specified by **b**.

- When **a** = 1, memory switch 1 is set as follows:

| Msw | Setting Value (b) | Function |
|------------|-------------------|--|
| 1-1 | 48 | Does not transmit the power-on notification |
| | 49 | Transmits the power-on notification |
| 1-2 | 48 | Sets receive buffer to large |
| | 49 | Sets receive buffer to small |
| 1-3 | 50 | Reserved |
| 1-4 | 48 | Data processing when occurring receive error: Ignore the data |
| | 49 | Data processing when occurring receive error: Replace with “?” |
| 1-5 | 48 | Automatic line feed enabled |
| | 49 | Automatic line feed disabled |
| 1-6 to 1-8 | 50 | Reserved |

When **a** = 2, memory switch 2 is set as follows:

| Msw | Setting Value (b) | Function |
|------------|-------------------|---|
| 2-1 | 48 | Code128 Check Digit is enabled |
| | 49 | Code128 Check Digit is disabled |
| 2-2 | 48 | Code1TF Leading 0 is enabled |
| | 49 | Code1TF Leading 0 is disabled |
| 2-3 | 48 | Barcode String Term is enabled |
| | 49 | Barcode String Term is disabled |
| 2-4 to 2-5 | 50 | Reserved |
| 2-6 | 48 | Endurance Test is disabled |
| | 49 | Endurance Test is enabled |
| 2-7 | 48 | Power Button Delay 3 seconds (only iPRINT) |
| | 49 | Power Button Delay 0 seconds (only iPRINT) |
| 2-8 | 48 | Listen to Real-Time-Commands – Always |
| | 49 | Listen to Real-Time-Commands – Only if Receive-Buffer is not full |

When **a** = 128, memory switch 128 is set as follows:

| Msw | Setting Value (b) | Function |
|-------|-------------------|---|
| 128-1 | 48 | Power button is enabled |
| | 49 | Power button is disabled |
| 128-2 | 48 | In Sleep-Mode is Interface Power On (only TH230+) |
| | 49 | In Sleep-Mode is Interface Power Off (only TH230+) |
| 128-3 | 48 | Sleep-Mode enabled |
| | 49 | Sleep-Mode disabled (default) |
| 128-4 | 48 | Legacy printer support disabled * |
| | 49 | Legacy printer support enabled * |
| 128-5 | 48 | Receipt shooting is disabled |
| | 49 | Receipt shooting is enabled |
| 128-6 | 48 | Paper-Near-End Sensor Notification in ASB and printer status will be send |
| | 49 | Paper-Near-End Sensor Notification in ASB and printer status will be suppressed |
| 128-7 | 48 | Black mark sensor is disabled |
| | 49 | Black mark sensor is enabled |
| 128-8 | 48 | Original Controller: Yes |
| | 49 | Original Controller: No |

* The printer must be switched off and on to take effect of changed setting!

Notes:

- This function works only in the user setting mode.
- The value of the memory switch is specified from bit 8 to bit 1 by **b1₈...b1₁**. When **b** = 50, the status of the bit applied is not changed.

Example:

Transmission data that specifies memory switch 128, "Power button is disabled" and does not change other settings.

```

ASCII:  GS  (   E   pL  pH  fn  a   b8  b7  b6  b5
        b4  b3  b2  b1
Hex:    0x1D 0x28 0x45 0x0A 0x00 0x03 0x80 0x32 0x32 0x32 0x32
        0x32 0x32 0x32 0x31
  
```

- Explanation for memory switch 1 (**a** = 1):

| Power-on notification | Hex | Decimal | Data quantity |
|-----------------------|------|---------|---------------|
| Header | 0x3B | 59 | 1 byte |
| Identifier | 0x31 | 49 | 1 byte |
| NUL | 0x00 | 0 | 1 byte |

- The printer transmits the power-on notification for the following processes:
 - Initializing by turning on the power by switch (except with Ethernet interface)
 - Initializing by hardware reset (except with Ethernet interface)
 - Initializing by software reset, such as by transmitting Function 2 (except with Ethernet interface and Ethernet parameter changed)
 - Initializing after the service menu functions² (except with Ethernet interface and Ethernet parameter changed)
- With a serial interface, the printer transmits a 3-byte notification without confirming that the host can receive data.
- With Ethernet interface the power-on notification will be not transmitted after power-on or the command GS 0xFF.
- When communication with the printer uses XON/XOFF control, the XON/XOFF code may interrupt the “Header to NUL” data string.
- When using the power-on notification together with other status messages, the status transmitted must be differentiated according to table Transmit Status Identification (see page 196).
- The printer must be switched off and on to take effect of changed setting for “Legacy printer support” memory switch (Msw 128-4)!
- The value for receipt shooting flush time will be set in the customer value CV 13 (see page 105)
- The disable of power button is only related to the switch off function.
- Memory switch “Original Controller” (Memory switch 128-8) is used to differentiate between original controller and repaired controller. If the printer is equipped with its first controller (original controller) this Memory switch is 0. After a controller change this Memory switch is set to 1.
- Memory switch “Power Button Delay” (Memory switch 2-7): The delay time is effective when switching off the device. When switching on the power button reacts always with no delay.
- Memory switches 1-2: Small receive buffer is not recommended for normal printer operations! It is not allowed when using a TH230+ fiscal controller interface.

GS (E p_L p_H fn a <Function 4>**Code ASCII:** GS (E p_L p_H fn a**Code HEX:** 0x1D 0x28 0x45 0x02 0x00 0x04 a**Range:** (p_L + p_H × 256) = 2 (p_L = 2, p_H = 0):
fn = 4

a = 1, 2, 128

Description: The printer transmits the value for the memory switch specified by parameter a to the host.

- Notes:**
- This function works both in user setting mode and during normal printer operation.
 - The printer transmits the “Header to NUL” data shown below:

| Transmit data | Hex | Decimal | Data quantity |
|---------------|--------------|----------|---------------|
| Header | 0x37 | 55 | 1 byte |
| Identifier | 0x21 | 33 | 1 byte |
| Setting value | 0x30 or 0x31 | 48 or 49 | 8 byte |
| NULL | 0x00 | 0 | 1 byte |

- The value of the memory switch is transmitted from bit 8 to bit 1. 48 or 49 is transmitted for a bit of Reserved.
- The host can differentiate the data for the memory switch from other transmitted data by the specific information in the transmit data block. When the header transmitted from the printer is 0x37 or 55 decimal, the data up to NUL (0x00 or 0 decimal) is handled as one group and can be identified by the following data:

| Transmit data | Hex | Decimal |
|-----------------------|------|---------|
| 1st byte (header) | 0x37 | 55 |
| 2nd byte (identifier) | 0x21 | 33 |

However, consider the following requirement for data processing:

- When communication with the printer uses XON/XOFF control, the XOFF code may interrupt the “Header to NUL” data string.

GS (E p_L p_H fn [a1 n_{1L} n_{1H}]...[ak nk_L nk_H] <Function 5>

Code ASCII: GS (E p_L p_H fn [a1 n_{1L} n_{1H}]...[ak nk_L nk_H]

Code HEX: 0x1D 0x28 0x45 p_L p_H 0x05 [a1 n_{1L} n_{1H}]...[ak nk_L nk_H]

Range: $4 \leq (p_L + p_H \times 256) \leq 65533$ ($0 \leq p_L \leq 255, 0 \leq p_H \leq 255$): $(p_L + p_H \times 256) = 3 \times k + 1$
fn = 5

$1 \leq k \leq 21844$

a = 3, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

$(n_L + n_H \times 256) = 2, 6$ ($n_L = 2, 6, n_H = 0$) [a = 3]

$-10 \leq (n_L + n_H \times 256) \leq 6$, ($246 \leq n_L \leq 255, n_H = 255$), ($0 \leq n_L \leq 6, n_H = 0$) [a = 5]

$0 \leq (n_L + n_H \times 256) \leq 255$ ($0 \leq n_L \leq 255, n_H = 0$) [a = 6]

$(n_L + n_H \times 256) = 0, 48 \leq (n_L + n_H \times 256) \leq 110$ ($n_L = 0, 48 \leq n_L \leq 110, n_H = 0$) [a = 9]

$70 \leq (n_L + n_H \times 256) \leq 220$ ($70 \leq n_L \leq 220, n_H = 0$) [a = 10]

$70 \leq (n_L + n_H \times 256) \leq 300$ ($70 \leq n_L \leq 255, n_H = 1$) [a = 10] (Only TH230+ Draft)

$1 \leq (n_L + n_H \times 256) \leq 65535$ ($0 \leq n_L \leq 255, 0 \leq n_H \leq 255$) [a = 11]

$-10 \leq (n_L + n_H \times 256) \leq 6$, ($246 \leq n_L \leq 255, n_H = 255$), ($0 \leq n_L \leq 6, n_H = 0$) [a = 12]

$0 \leq (n_L + n_H \times 256) \leq 255$, ($0 \leq n_L \leq 255, n_H = 0$), [a = 13]

$0 \leq (n_L + n_H \times 256) \leq 2$, ($0 \leq n_L \leq 255, n_H = 0$), [a = 18]

Default: $(n_L + n_H \times 256) = 6$ [default value when a = 3]

$(n_L + n_H \times 256) = 0$ [default value when a = 5]

$(n_L + n_H \times 256) = 0$ [default value when a = 6]

$(n_L + n_H \times 256) = 0$ [default value when a = 9]

$(n_L + n_H \times 256) = 220$ [default value when a = 10]

$(n_L + n_H \times 256) = 100$ [default value when a = 11]

$(n_L + n_H \times 256) = 0$ [default value when a = 12]

$(n_L + n_H \times 256) = 8$ [default value when a = 13]

$(n_L + n_H \times 256) = 10$ TH230 / = 60 TH230+ [default value when a = 14]

$(n_L + n_H \times 256) = 1700$ [default value when a = 15]

$(n_L + n_H \times 256) = 0$ [default value when a = 16]

$(n_L + n_H \times 256) = 0$ [default value when a = 17]

$(n_L + n_H \times 256) = 0$ [default value when a = 18]

Description: Changes the customized value specified by parameter **a** to $(n_L + n_H \times 256)$.

| a | Customized value |
|----------|---|
| 3 | Paper width |
| 5 | Print density |
| 6 | BM adjustment value |
| 9 | Maximum power |
| 10 | Maximum speed |
| 11 | Number of Endurance test tickets |
| 12 | Color density |
| 13 | Receipt shooting flush time |
| 14 | Sleep-Mode waiting time |
| 15 | Power on to Cash Drawer opening delay |
| 16 | Default character code table |
| 17 | Auto Recovery |
| 18 | Power On Behavior |

Paper width settings (a = 3):

| $(n_L + n_H * 256)$ | Paper width | Default |
|---------------------|-------------|---------|
| 2 | 57.5 mm | 80 mm |
| 6 | 80 mm | |

Print density settings (a = 5):

| $(n_L + n_H * 256)$ | Print density | Default |
|---------------------|---------------|---------|
| -10 (65526) | 50 % | 100 % |
| -9 (65527) | 55 % | |
| -8 (65528) | 60 % | |
| -7 (65529) | 65 % | |
| -6 (65530) | 70 % | |
| -5 (65531) | 75 % | |
| -4 (65532) | 80 % | |
| -3 (65533) | 85 % | |
| -2 (65534) | 90 % | |
| -1 (65535) | 95 % | |
| 0 | 100 % | |
| 1 | 105 % | |
| 2 | 110 % | |
| 3 | 115 % | |
| 4 | 120 % | |
| 5 | 125 % | |
| 6 | 130 % | |

BM adjustment value offset (a = 6):

| $(n_L + n_H * 256)$ | BM offset | Default |
|---------------------|---|---------|
| 0...127 | Offset value with forward direction in 0.125 mm | 0 |
| 128...255 | Offset value with backward direction in 0.125 mm (two's complement) | |

Maximum power (a = 9):

| $(n_L + n_H * 256)$ | Maximum power | Default |
|---------------------|----------------|---------|
| 0 | Auto | Auto |
| 48 ... 110 | 48 W ... 110 W | |

Maximum speed (a = 10):

| $(n_L + n_H * 256)$ | Maximum speed | Default |
|---------------------|------------------------------|------------|
| 70 ... 220 | Speed in mm/sec | 220 mm/sec |
| 70 ... 300 | Speed in mm/sec TH230+ Draft | 220 mm/sec |

TH230+ High Speed Draft Mode

Values in the range 220 to 300 are only allowed in the TH230+ printer. This maximum speed is only reached if the print density is lower than 100%.

For example:

300 mm/s is reached with 65% density or less.

260 mm/s is reached with 85% density.

235 mm/s is reached with 100% density.

The reached maximum speed depends on the voltage and the temperature.

Number of Endurance test tickets (a = 11):

| $(n_L + n_H * 256)$ | Number of tickets | Default |
|---------------------|---|-------------|
| 1 ... 65534 | Number of tickets printed in the Endurance test | 100 tickets |

Color density settings (a = 12):

| $(n_L + n_H * 256)$ | Print density | Default |
|---------------------|---------------|---------|
| -10 (65526) | 50 % | 100 % |
| -9 (65527) | 55 % | |
| -8 (65528) | 60 % | |
| -7 (65529) | 65 % | |
| -6 (65530) | 70 % | |
| -5 (65531) | 75 % | |
| -4 (65532) | 80 % | |
| -3 (65533) | 85 % | |
| -2 (65534) | 90 % | |
| -1 (65535) | 95 % | |
| 0 | 100 % | |
| 1 | 105 % | |
| 2 | 110 % | |
| 3 | 115 % | |
| 4 | 120 % | |
| 5 | 125 % | |
| 6 | 130 % | |

Receipt shooting flush time (a=13)

| $(n_L + n_H * 256)$ | Flush time | Default |
|---------------------|------------------|---------|
| 0 | Endless | 0 |
| 1 ... 255 | Time in 0.25 sec | |

This value sets the time how long the printer is waiting for print commands from the host before the receipt is printed out. The value must be multiplied by 250 milliseconds (i.e. CV13 = 8 -> Receipt shooting flush time = 2 sec).

The range is from 1 to 255 (250 ms to 63,75 seconds) or 0 for endless (default).

If the Memory Switch for receipt shooting (128-5 / see page 98) is disabled the printer ignores this time.

If the host sends a cut or graphics command the receipt is printed out (Logo's are buffered). The buffered data can also be printed out by the sequence ESC w n 7 (see page 77). After this the host have to wait for the answer of ESC w n 7.

NOTE: If both Receipt shooting and Sleep-Mode are enabled and the Sleep-Mode time is equal or smaller than the shooting time the buffered Receipt is not printed out in Sleep-Mode.

NOTE: The Receipt shooting spooler is flushed if the command "Set control point" is used.

Sleep-Mode waiting time (a=14)

| $(n_L + n_H * 256)$ | Waiting time | Default |
|---------------------|--------------|--------------|
| 0 | Endless | TH230 10 sec |
| 10 ... 2550 | Time in sec | TH230+ 1 min |

This value sets the time how long the printer is waiting before Sleep-Mode starts. The value corresponds to the waiting time in seconds (i.e. CV14 = 30 -> Sleep-Mode starts after 30 seconds). The range is from 10 to 2550 with step of 10 (10 seconds to 42,5 minutes). The default value is 10 seconds. When the printer receives a value that is e.g. between 11 and 19 then the stored result is 10 (rounded down). If the Memory Switch for Sleep-Mode (128-3 / see page 98) is disabled the printer ignores this time. The power consumption of the Sleep-Mode is lower than in normal standby. The operator panel LED's are switched off but the power LED is flashing with short on-time and long off-time. The power pin of the customer display connector is also switched to off. The Power consumption of a RS232-Interface is a little bit higher compared to an USB-Interface. The printer leaves the Sleep-Mode by every transmitted data on the host interface, by pressing the feed button or power button or when the cover sensor is changed.

NOTE:

- If both Receipt shooting and Sleep-Mode are enabled and the Sleep-Mode time is equal or smaller than the shooting time the buffered receipt is not printed out in Sleep-Mode.
- If a macro running, Sleep mode is inactive
- If an error occurred, Sleep mode is inactive
- If no paper inserted, Sleep mode is inactive

Power on (Sleep mode) to Cash drawer opening delay (a=15)

| $(n_L + n_H * 256)$ | Delay time | Default |
|---------------------|--------------|-----------|
| 0 ... 5000 | Time in msec | 1700 msec |

This value sets the time how long the printer is waiting after Sleep-Mode ends before Cash Drawer can be opened. The value corresponds to the delay time in msec (i.e. CV15 = 1700 -> Cash Drawer opening after 1,7 seconds). The range is from 0 to 5000 with step of 100 (0 seconds to 5 seconds). The default value is 1,7 seconds. When the printer receives a value that is e.g. between 1 and 99 then the stored result is 0 (rounded down). If the Memory Switch for Sleep-Mode (128-3 / see page 98) is disabled the printer ignores this time.

Default character code table after Reset (a=16)

| $(n_L + n_H * 256)$ | Code Page | Default |
|---------------------|------------------|-----------|
| 0 ... 255 | Equal to ESC t n | 0 (PC437) |

This value sets the Code Page number that is used after switch on the Printer or after use the sequence ESC @.

- This value should be set to a value which is listed at ESC t n (see page 74). If it is not listed in ESC t n then a Value of 0 is taken.
- Sometimes it is not possible to change the application program and in addition the application program needs a code page which is different to PC437. This custom value is used to set a specific start code page without changing the application program.

Auto Recovery (a=17)

| $(n_L + n_H * 256)$ | Auto Recovery Mode | Default |
|---------------------|--------------------|---------|
| 0 | Off | 0 (Off) |
| 1, 2 | Equal to DLE ENQ n | |

This value sets the Auto Recovery Mode that is executed in error condition by closing the Cover. The Mode is the same like DLE ENQ n and mines

- 0: No Recover
- 1: Recover without clearing
- 2: Recover with clearing

Power On Behavior (a = 18):

This custom value is only available in iPRINT.

| $(n_L + n_H * 256)$ | Power On Behavior | Default |
|---------------------|--------------------------------------|---------|
| 0 | Restore last state before power fail | 0 |
| 1 | System is always switched on | |
| 2 | System is always switched off | |

Notes:

- This function works only in user setting mode.
- To activate the customized values you set with this function, you must transmit a Function 2 command.
- Customized value can be specified by the unit of 3 bytes [a n_L n_H].
- Example: Transmit data when changing the paper width to 57.5 mm

ASCII: GS (E pL pH fn a n_L n_H
Hex: 0x1D 0x28 0x45 0x04 0x00 0x05 0x03 0x02 0x00

- The setting value of the print speed is effective when the printer performs in proper condition. Print speed may slow temporarily, depending on the operating environment or the print duty.

- **a = 6:** The cutting position behind a black mark can be adjusted by an internal correction value which is restored after every power-on. (Refer to GS_(F); Bit 7 is used as direction bit, Bit 6 – Bit 0 as offset value.
- **a = 9:** If maximum power setting “Auto” is selected, the printer detects the power of the connected power supply automatically. This works with all power supplies from Wincor Nixdorf.
If a power supply from another manufacturer is used, the maximum power setting has to be adjusted to the value of the used power supply e.g. 55W, 75W, 90W or 110W.
- **a = 9:** If the setting “Auto” is selected and no WINCOR-NIXDORF power supply is used, the printer responds with the string “ID-FAIL 48” and selects 48 Watt (command GS (E (fn = 6) see page 109). In this case the user has to set a fix maximum power setting according to the used power supply. To indicate this condition the green Power LED is blinking (see page 5).
- **a = 9:** If the setting “Auto” is selected and the interface card is an PoweredUSB type, then the printer selects 75 Watt automatically. Of course this value can be changed by the command GS (E (fn = 6) see page 109).
- **a = 9:** Please note that reducing the maximum power setting leads to a bad performance of print speed and print quality.
- **a = 10:** The maximum speed setting depends from the inserted paper.
- **a = 12:** This setting is the density of the color, which is different to black (red, green, blue).
- **a = 18:** This setting is available only for the BEETLE /iPrint system.

GS (E p_L p_H fn a <Function 6>**Code ASCII:** GS (E p_L p_H fn a**Code HEX :** 0x1D 0x28 0x45 0x02 0x00 0x06 a**Range:** (p_L + p_H × 256) = 2 (p_L = 2, p_H = 0):
fn = 6

a = 3, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

Description: The printer transmits the host the customized value for the NV memory area specified by parameter a.

| a | Customized value |
|----|---------------------------------------|
| 3 | Paper width |
| 5 | Print density |
| 6 | BM adjustment value offset |
| 7 | Sensor values |
| 9 | Maximum power |
| 10 | Maximum speed |
| 11 | Number of Endurance test tickets |
| 12 | Color density |
| 13 | Receipt shooting flush time |
| 14 | Sleep-Mode waiting time |
| 15 | Power on to Cash Drawer opening delay |
| 16 | Default character code table |
| 17 | Auto Recovery Mode |
| 18 | Power On Behavior |

Paper width (a = 3):

| Paper width | hexadecimal | decimal |
|-------------|-------------|---------|
| 57.5 mm | 0x32 | 50 |
| 80 mm | 0x36 | 54 |

Print density settings (a = 5):

| Print density | hexadecimal | | | | | decimal | | | | |
|---------------|-------------|------|------|------|------|---------|----|----|----|----|
| | d1 | d2 | d3 | d4 | d5 | d1 | d2 | d3 | d4 | d5 |
| 50 % | 0x36 | 0x35 | 0x35 | 0x32 | 0x36 | 54 | 53 | 53 | 50 | 54 |
| 55 % | 0x36 | 0x35 | 0x35 | 0x32 | 0x37 | 54 | 53 | 53 | 50 | 55 |
| 60 % | 0x36 | 0x35 | 0x35 | 0x32 | 0x38 | 54 | 53 | 53 | 50 | 56 |
| 65 % | 0x36 | 0x35 | 0x35 | 0x32 | 0x39 | 54 | 53 | 53 | 50 | 57 |
| 70 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x30 | 54 | 53 | 53 | 51 | 48 |
| 75 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x31 | 54 | 53 | 53 | 51 | 49 |
| 80 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x32 | 54 | 53 | 53 | 51 | 50 |
| 85 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x33 | 54 | 53 | 53 | 51 | 51 |
| 90 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x34 | 54 | 53 | 53 | 51 | 52 |
| 95 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x35 | 54 | 53 | 53 | 51 | 53 |
| 100 % | 0x30 | - | - | - | - | 48 | - | - | - | - |
| 105 % | 0x31 | - | - | - | - | 49 | - | - | - | - |
| 110 % | 0x32 | - | - | - | - | 50 | - | - | - | - |
| 115 % | 0x33 | - | - | - | - | 51 | - | - | - | - |
| 120 % | 0x34 | - | - | - | - | 52 | - | - | - | - |
| 125 % | 0x35 | - | - | - | - | 53 | - | - | - | - |
| 130 % | 0x36 | - | - | - | - | 54 | - | - | - | - |

BM adjustment value offset (a = 6):

| BM offset | Direction (Bit 7) | Value (Bit 6 – Bit 0) | |
|-----------|-------------------|-----------------------|-------------|
| | | decimal | hexadecimal |
| 0...127 | 0 – Forwards | 0...127 | 0x00...0x7F |
| 128...255 | 1 – Backwards | 0...127 | 0x00...0x7F |

Two's complement values in backward direction.

Sensor values (a = 7):

| Sensor | Value | | Backup Value | |
|----------------|---------|-----|--------------|---|
| BM Sensor/tab: | 0...255 | - (| 0...255 |) |

Maximum power (a = 9):

| Power value setting | | String | d1 | d2 | d3 | d4 | d5 | d6 | d7 | d8 | d9 | d10 |
|---------------------|---------|---------------------------------------|----------------------|----------|----------|----------|----------|----------|----|----|----|-----|
| n | Meaning | | | | | | | | | | | |
| 0 | Auto | Example: "Auto 55" or "ID-Fail 48" | 0x410x75 0x490x44 | 0x740x2D | 0x6F0x46 | 0x200x61 | 0x370x69 | 0x350x6C | - | - | - | - |
| 48 | 48W | "48" | 0x340x38 | - | - | - | - | - | - | - | - | - |
| ... | ... | ... | ... | ... | - | - | - | - | - | - | - | - |
| 75 | 75W | "75" | 0x370x35 | - | - | - | - | - | - | - | - | - |
| ... | ... | ... | ... | ... | - | - | - | - | - | - | - | - |
| 110 | 110W | "110" | 0x310x31 | 0x30 | - | - | - | - | - | - | - | - |

Maximum speed (a = 10):

| Maximum speed setting | | String | d1 | d2 | d3 |
|-----------------------|-----------------|--------|------|------|------|
| n | Speed in mm/sec | | | | |
| 70 | 70 mm/sec | "70" | 0x37 | 0x30 | - |
| 71 | 71 mm/sec | "71" | 0x37 | 0x31 | - |
| ... | ... | ... | ... | ... | ... |
| 219 | 219 mm/sec | "219" | 0x32 | 0x31 | 0x39 |
| 220 | 220 mm/sec | "220" | 0x32 | 0x32 | 0x30 |
| Only TH230+ Draft | | | | | |
| ... | ... | ... | ... | ... | ... |
| 300 | 300 mm/sec | "300" | 0x33 | 0x30 | 0x30 |

Number of Endurance test tickets (a = 11):

| Number of tickets printed in the Endurance test | String | d1 | d2 | d3 | d4 | d5 |
|---|---------|------|------|------|------|------|
| 1 | "1" | 0x31 | - | - | - | - |
| 2 | "2" | 0x32 | - | - | - | - |
| ... | ... | ... | ... | ... | ... | ... |
| 65534 | "65534" | 0x36 | 0x35 | 0x35 | 0x33 | 0x34 |
| 65535 | "65535" | 0x36 | 0x35 | 0x35 | 0x33 | 0x35 |

Color density settings (a = 12):

| Print density | hexadecimal | | | | | decimal | | | | |
|---------------|-------------|------|------|------|------|---------|----|----|----|----|
| | d1 | d2 | d3 | d4 | d5 | d1 | d2 | d3 | d4 | d5 |
| 50 % | 0x36 | 0x35 | 0x35 | 0x32 | 0x36 | 54 | 53 | 53 | 50 | 54 |
| 55 % | 0x36 | 0x35 | 0x35 | 0x32 | 0x37 | 54 | 53 | 53 | 50 | 55 |
| 60 % | 0x36 | 0x35 | 0x35 | 0x32 | 0x38 | 54 | 53 | 53 | 50 | 56 |
| 65 % | 0x36 | 0x35 | 0x35 | 0x32 | 0x39 | 54 | 53 | 53 | 50 | 57 |
| 70 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x30 | 54 | 53 | 53 | 51 | 48 |
| 75 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x31 | 54 | 53 | 53 | 51 | 49 |
| 80 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x32 | 54 | 53 | 53 | 51 | 50 |
| 85 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x33 | 54 | 53 | 53 | 51 | 51 |
| 90 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x34 | 54 | 53 | 53 | 51 | 52 |
| 95 % | 0x36 | 0x35 | 0x35 | 0x33 | 0x35 | 54 | 53 | 53 | 51 | 53 |
| 100 % | 0x30 | - | - | - | - | 48 | - | - | - | - |
| 105 % | 0x31 | - | - | - | - | 49 | - | - | - | - |
| 110 % | 0x32 | - | - | - | - | 50 | - | - | - | - |
| 115 % | 0x33 | - | - | - | - | 51 | - | - | - | - |
| 120 % | 0x34 | - | - | - | - | 52 | - | - | - | - |
| 125 % | 0x35 | - | - | - | - | 53 | - | - | - | - |
| 130 % | 0x36 | - | - | - | - | 54 | - | - | - | - |

Receipt shooting flush time (a = 13):

| Value | Flush time |
|---------|------------------------|
| 1...255 | 250 msec ... 63.75 sec |
| 0 | Endless |

Sleep-Mode waiting time (a = 14):

| Value | Waiting time |
|-----------|---------------------|
| 10...2550 | 10 sec ... 42,5 min |

Power on (Sleep mode) to Cash drawer opening delay (a=15):

| Value | Delay time |
|----------|-----------------|
| 0...5000 | 0 sec ... 5 sec |

Default character code table (a=16):

| Value | Code table |
|---------|------------|
| 0...255 | 0...255 |

Auto Recovery Mode (a=17):

| Value | Auto Recovery Mode |
|-------|--------------------------|
| 0 | Off |
| 1 | Recover without clearing |
| 2 | Recover with clearing |

1 and 2 is equal to the function DLE ENQ n

Power On Behavior (a=18):

This custom value is only available in iPRINT.

| Value | Power On Behavior |
|-------|--------------------------------------|
| 0 | Restore last state before power fail |
| 1 | System is always switched on |
| 2 | System is always switched off |

Notes:

- This function works both in user setting mode and during normal printer operation.
- The printer transmits the data below ("Header to NUL") with this function::

| Transmit data | Hex | Decimal | Data quantity |
|-------------------|-------------|---------|---------------|
| Header | 0x37 | 55 | 1 byte |
| Identifier | 0x27 | 39 | 1 byte |
| Value number (*1) | 0x31 – 0x39 | 48 – 57 | 1 – 3 bytes |
| Separation code | 0x1F | 31 | 1 byte |
| Setting (*2) | 0x30 – 0x39 | 48 – 57 | 1 – 5 bytes |
| NULL | 0x00 | 0 | 1 byte |

(*1) The value number in the table above is the same value as parameter **a**.

(*2) The setting is determined by the value defined in Function 5.

- Settings expressed as decimal numbers are converted to ASCII character data and transmitted from the most significant digit.
Example: When 120 bytes is being used, 120 is expressed with 3 bytes of data (decimal numbers = 49, 50, 48).
- The host can differentiate the data for the customized memory setting from other data the printer transmits by the specific information in the transmit data block. When the header transmitted from the printer is 0x37 or 55 decimal, the data up to NUL (0x00 or 0 decimal) is handled as one group and can be identified using the following data:

| Transmit data | Hex | Decimal |
|-----------------------------------|------|---------|
| 1 st byte (header) | 0x37 | 55 |
| 2 nd byte (identifier) | 0x27 | 39 |

However, consider the following requirement for data processing:

- When communication with the printer uses XON/XOFF control, the XOFF code may interrupt the “Header to NUL” data string.
- **a = 9:** If the setting “Auto” is selected and no WINCOR-NIXDORF power supply is used, the printer responds with the string “ID-FAIL 48” and selects 48 Watt. In this case the user has to set a fix maximum power setting according to the used power supply.

a = 9: Please note that a reduced maximum power setting leads to a bad performance of print speed and print quality.

GS (E p_L p_H fn a d1...dk <Function 11>

Code ASCII: GS (E p_L p_H fn a d1...dk

Code HEX: 0x1D 0x28 0x45 p_L p_H 0x0B a d1...dk

Range: $3 \leq (p_L + p_H \times 256) \leq 65535$ ($0 \leq p_L \leq 255, 0 \leq p_H \leq 255$)

fn = 11

$1 \leq a \leq 4$

$48 \leq d \leq 57$ [a = 1]

$48 \leq d \leq 50$ [a = 2]

d = 48, 49 [a = 3]

d = 55, 56 [a = 4]

$1 \leq k \leq 65532$

Default: d1...dk = "19200" [a = 1] = 19200 baud

d = 48 [a = 2] = no parity

d = 48 [a = 3] = flow control of DTR/DSR

d = 56 [a = 4] = 8 bits length

Description: Change the communication settings of the serial interface defined by a.

| a | Communication condition |
|---|-------------------------|
| 1 | Baud rate |
| 2 | Parity |
| 3 | Flow control |
| 4 | Bit length |

- Baud rate (a = 1) is specified by number.

The following 8 baud rates are selectable: "1200 ", "2400 ", "4800 ", "9600 ", "19200 ", "38400 ", "57600 " and "115200 ".

Example: When defining 19200 bps: 5 bytes as "19200" (decimal = 49, 57, 50, 48, 48)

| Baud rate (bps) | d1 | d2 | d3 | d4 | d5 | d6 |
|-----------------|----|----|----|----|----|----|
| 1200 | 49 | 50 | 48 | 48 | -- | -- |
| 2400 | 50 | 52 | 48 | 48 | -- | -- |
| 4800 | 52 | 56 | 48 | 48 | -- | -- |
| 9600 | 57 | 54 | 48 | 48 | -- | -- |
| 19200 | 49 | 57 | 50 | 48 | 48 | -- |
| 38400 | 51 | 56 | 52 | 48 | 48 | -- |
| 57600 | 53 | 55 | 54 | 48 | 48 | -- |
| 115200 | 49 | 49 | 53 | 50 | 48 | 48 |

- Parity (**a** = 2) is specified by **d** as follows:

| d | Function |
|----------|--------------------|
| 48 | Select no parity |
| 49 | Select odd parity |
| 50 | Select even parity |

- Flow control (**a** = 3) is specified by **d** as follows:

| d | Function |
|----------|---------------------------------|
| 48 | Select Flow control of DTR/DSR |
| 49 | Select Flow control of XON/XOFF |

- Bit length (**a** = 4) is specified by **d** as follows:

| d | Function |
|----------|----------------------|
| 55 | Select 7 bits length |
| 56 | Select 8 bits length |

Notes:

- If the communication control between host and printer does not correspond, the printer cannot process data from the host normally, and the host cannot receive data from the printer normally.
- This function works in user setting mode.
- The communication condition set by this function is enabled by executing Function 2 or restarting the printer. It is necessary to change the communication condition of the host to be the same as the printer to communicate with the printer.

GS (E p_L p_H fn a <Function 12>

Code ASCII: GS (E p_L p_H fn a

Code HEX: 0x1D 0x28 0x45 p_L p_H 0x0C a

Range: (p_L + p_H × 256) = 2 (p_L = 2, p_H = 0)

fn = 12

1 ≤ a ≤ 4

Description: Transmit the setting value of the serial interface communication condition specified by a.

| a | Communication condition |
|---|-------------------------|
| 1 | Baud rate |
| 2 | Parity |
| 3 | Flow control |
| 4 | Bit length |

Notes:

- This function works in user setting mode and during normal operation.
- This function transmits “Header to NUL” as follows:

| Transmit data | Hex | Decimal | Data quantity |
|------------------------------|-------------|---------|---------------|
| Header | 0x37 | 55 | 1 byte |
| Identifier | 0x33 | 51 | 1 byte |
| Communication condition (*1) | 0x31–0x34 | 49–52 | 1 byte |
| Separator | 0x1F | 31 | 1 byte |
| Setting value (*2) | 0x30 – 0x39 | 48 – 57 | 1 – 5 bytes |
| NULL | 0x00 | 0 | 1 byte |

(*1) Communication condition is specified by a.

(*2) Setting value is set by Function 11.

- “Setting value” is set by Function 11. It might differ from the current communication condition before executing Function 2.
- This function is used to confirm whether Function 11 ends normally before executing Function 2.
- The host can differentiate the setting value of the customize value from other transmit data by the specific data in the transmit data block. When the header transmitted from the printer is [hex = 0x37, decimal = 55], the data up to NUL [hex = 00H, decimal = 0] is handled as one group and can be identified by the following data:

| Transmit data | Hex | Decimal |
|-----------------------------------|------|---------|
| 1 st byte (header) | 0x37 | 55 |
| 2 nd byte (identifier) | 0x33 | 51 |

However, consider the following requirement for data processing.

When communication with the printer uses XON/XOFF control, the XOFF may interrupt the “Header to NUL” data string.

GS (E p_L p_H fn d1...dn (fn=129)**Function:** Set serial number**Code ASCII:** GS (E p_L p_H fn d1 ... dn**Code HEX:** 0x1D 0x28 0x45 p_L p_H 0x81 d1 ... dn**Range:** $2 \leq (p_L + p_H \times 256) \leq 11$ **fn** = 129 $32 \leq d \leq 255$ $1 \leq n \leq 10$ **Description:** Set the serial number in the EEPROM. Parameter **d1 ... dn** specifies the serial number in ASCII character's as a string without zero at the end. The max size of the string is 10 characters.

- Notes:**
- **This command can be used only once!**
 - This function code (**fn** = 129) is enabled only in the user setting mode.
 - If the value of (**p_L** + **p_H** * 256) is out of the specified range, this command is ignored.

GS (E p_L p_H fn d1...dn (fn=130)**Function:** Set production date**Code ASCII:** GS (E p_L p_H fn d1 ... dn**Code HEX:** 0x1D 0x28 0x45 p_L p_H 0x82 d1 ... dn**Range:** $(p_L + p_H \times 256) = 7$ **fn** = 130 $48 \leq d \leq 57$ **n** = 6 $01 \leq \mathbf{DD} \leq 31$ $01 \leq \mathbf{MM} \leq 12$ $00 \leq \mathbf{YY} \leq 99$ **Description:** Set the production date in the EEPROM. Parameter **d1...dn** specifies the production date in ASCII character's as a string without zero at the end. The format is **DDMMYY**.

- Notes:**
- **This command can be used only once!**
 - This function code (**fn** = 130) is enabled only in the user setting mode.
 - If the value of (**p_L** + **p_H** * 256) is out of the specified range, this command is ignored.
 - If the value of Day (**DD**), Month (**MM**) or Year (**YY**) is out of the specified range, this command is ignored.

GS (E p_L p_H fn a d1...dk <Function 131>

Code ASCII: GS (E p_L p_H fn a d1...dk

Code HEX: 0x1D 0x28 0x45 p_L p_H 0x83 a d1...dk

Range: $3 \leq (p_L + p_H \times 256) \leq 65535$ ($0 \leq p_L \leq 255, 0 \leq p_H \leq 255$)

fn = 131

$2 \leq a \leq 6$

d = 48,49 [a = 2,6]

d = 46, 48..57 [a = 3,4,5]

$1 \leq k \leq 65532$

Default: d = 49 [a = 2] = DHCP enabled

d1...dk = "192.0.0.192" [a = 3] = IP Address

d1...dk = "0.0.0.0" [a = 4] = Net Mask

d1...dk = "0.0.0.0" [a = 5] = Gateway

d1...dk = 48 [a = 6] = Boot/P disabled

Description: Change the communication settings of the Ethernet interface defined by a.

| a | Communication condition |
|---|-----------------------------|
| 2 | DHCP |
| 3 | IP Address |
| 4 | Net Mask |
| 5 | Gateway |
| 6 | Boot/P (Bootstrap Protocol) |

- DHCP (a = 2) is specified by d as follows:

| d | Function |
|----|---------------|
| 48 | DHCP disabled |
| 49 | DHCP enabled |

Enabling DHCP will set the IP and gateway address to "0.0.0.0" and the net mask to "255.255.255.0" automatically!

- IP address, Net Mask and Gateway (a = 3,4,5) have a dotted-decimal notation format. Setting the IP address, will disable the DHCP automatically!

Examples: "192.0.0.5", "138.17.000.13"

- Boot/P (a = 6) is specified by d as follows:

| d | Function |
|----|-----------------|
| 48 | Boot/P disabled |
| 49 | Boot/P enabled |

Notes:

- This function works only, if an Ethernet interface card is installed!
- If the communication control between host and printer does not correspond, the printer cannot process data from the host normally, and the host cannot receive data from the printer normally.
- This function works in user setting mode.

GS (E p_L p_H fn a <Function 132>

Code ASCII: GS (E p_L p_H fn a

Code HEX: 0x1D 0x28 0x45 p_L p_H 0x84 a

Range: (p_L + p_H × 256) = 2 (p_L = 2, 0 ≤ p_H = 0)

fn = 132

1 ≤ a ≤ 6

Description: Transmit the setting value of the Ethernet interface communication condition defined by a.

| a | Communication condition |
|---|-----------------------------|
| 1 | MAC Address (fixed) |
| 2 | DHCP |
| 3 | IP Address |
| 4 | Net Mask |
| 5 | Gateway |
| 6 | Boot/P (Bootstrap Protocol) |

Notes:

- This function works in user setting mode and during normal operation, but only, if an Ethernet interface card is installed!
- This function transmits “Header to NUL” as follows:

| Field | Value | Data quantity |
|------------------------------|-------------|---------------|
| Header | 0x37 | 1 byte |
| Identifier | 0x33 | 1 byte |
| Communication condition (*1) | 0x31 – 0x35 | 1 byte |
| Separator | 0x1F | 1 byte |
| Setting value (*2) | ASCII | 1 – 15 bytes |
| NULL | 0x00 | 1 byte |

(*1) Communication condition is specified by a.

(*2) Setting value is set by Function 131.

- “Setting value” is set by Function 131. It might differ from the current communication condition before executing Function 2.
- This function is used to confirm whether Function 131 ends normally before executing Function 2.

- The host can differentiate the setting value of the customize value from other transmit data by the specific data in the transmit data block. When the header transmitted from the printer is [hex = 0x37, decimal = 55], the data up to NUL [hex = 00H, decimal = 0] is handled as one group and can be identified by the following data:

| Transmit data | Hex | Decimal |
|-----------------------------------|------|---------|
| 1 st byte (header) | 0x37 | 55 |
| 2 nd byte (identifier) | 0x33 | 51 |

GS (F

Function: Set adjustment value(s)

Code ASCII: GS (F p_L p_H a fn n_L n_H

Code HEX: 0x1D 0x28 0x46 p_L p_H a fn n_L n_H

Range: $(p_L + (p_H \times 256)) = 4$ (where $p_L = 4$, $p_H = 0$)

a = 1

fn = 0, 48 or 1, 49

$0 \leq (n_L + n_H \times 256) \leq 65535$

(where $0 \leq n_L \leq 255$, $0 \leq n_H \leq 255$)

Default: All adjustment values are set to "0".

(At the factory setting, the print starting position and the cutting position are set to the head position and the cutter position respectively when the BM sensor detects the BM.)

Description: This command is effective only when the BM sensor is enabled with memory switch 0x80.

Sets adjustment values(s) for the printer operations specified by a.

- p_L , p_H specifies $(p_L + (p_H \times 256))$ for the number of bytes after p_H (a, fn, n_L and n_H).
- a specifies setting values for the positions to start printing.

| a | Function |
|---|--|
| 1 | Setting value for the positions to start the printing. |

The parameter is a dummy for further extensions. That's why, printer accept other values too, but don't use anyone of them.

- fn specifies the direction of the adjustment.

| fn | Function |
|-------|--|
| 0, 48 | Specifies a forward paper feeding direction |
| 1, 49 | Specifies a backward paper feeding direction |

- n_L and n_H specifies the setting value to $[(n_L + n_H \times 256) \times 0.125 \text{ mm}]$. Please note that the maximum setting value is 210 mm.

- The adjustment value for the print starting position (**a** = 1) is affected by the command FF
- (see page 24). The value "0" means cut below of the mark position.
- The print start position is relative to the lower edge of the detected mark.
- This command is stored in the receive buffer first from the host, and then executed in the execution process of other normal commands. Therefore, there may occur time delay for the execution of this command after the printer receives this command. The delay time depends on the status of the receive buffer.

If the adjustment value greater than the paper mark distance, printer feed only the remainder between adjustment value and mark distance + mark width (separator value *modulo* (mark distance + mark width)). For example, if the separator value is 180 mm and the mark distance 70, the feed after the mark will be 30 mm.

Notes:

- Please note that the maximum paper feeding amount can not be greater than the distance between two black marks

GS (L

Function: Specify graphics data

Description: Performs the various tasks related to graphics data listed in the table below.

- Function code **fn** specifies the individual function.

| fn | Function | Description |
|----------|-----------------------------|---|
| 0, 48 | Function 48 | Sends the entire capacity of NV graphics domains. |
| 3, 51 | Function 51 | Sends the available capacity of NV graphics memory. |
| 64 | Function 64 | Sends the key code list for defined NV graphics. |
| 65 | Function 65 | Performs batch deletion of all NV graphics data. |
| 66 | Function 66 | Deletes the specified NV graphics data. |
| 67 | Function 67 | Defines (in raster format) NV graphics data. |
| 69 | Function 69 | Prints the specified NV graphics. |

- **p_L** and **p_H** specify parameter values from **m** on as bytes (**p_L** + **p_H** × 256).
- **p1**, **p2**, **p3**, and **p4** specify parameter values from **m** on as bytes (**p1** + **p2** × 256 + **p3** × 65536 + **p4** × 16777216).
- [**parameter**] is included in descriptions of all functions

Recommended Functions:

- This command is recommended for use when printing image data.
- The image processing controlled using this command is referred to as the “Graphics function.” The name is important as it distinguishes it from conventional bit image functions.
- The graphics functions provided here maintain upward compatibility with conventional bit image processing.

| Graphics type | Corresponding bit image command |
|-------------------|---------------------------------|
| NV graphics | FS p, FS q |
| Download graphics | GS *, GS / |
| Graphics | GS Q 0, GS v 0 |

- The various graphics functions (of this command), more user-friendly than conventional bit image functions, offer the following advantages.
 - Definition of multiple items of logo mark and insignia data (with most functions).

- Management of data using key codes.
- Deletion of and redefinition of single items of data.
- Color coding of defined data.
- Definition of data in both raster and column formats.
- Confirmation of available capacity in domain.
- Continuous processing possible (without a software reset when a command has been processed).
- The following three types of graphics functions are included:
 - NV graphics [Functions 48, 51, 64, 65, 66, 67 and 69]
Stores data in non-volatile memory.
Defined data is retained when power is turned off.
There is a limit on the number of times that non-volatile memory can be written to.
 - Download graphics [Functions 52, 80, 81, 82, 83, 84, and 85]
Stores data in volatile memory (RAM).
Defined data is lost when the ESC @ command is executed, the system is reset, or power is turned off.
 - Graphics [Functions 50 and 112]
Stores data in the print buffer.
When standard mode is selected, prints data using Function 50 and clears the print buffer.
When page mode is selected, prints data using FF and ESC FF and clears the print buffer after FF is executed.

Notes:

- The functions of this command are determined by the **fn** setting. Actual command operation varies according to function.
- The NV graphics and download graphics data is managed using key codes.
 - Expressed as kc1 and kc2, the key codes are used to identify data groups.
 - The key codes have a 2-byte configuration and can be specified using the full range of character codes (0x32 to 0x7E).
 - The data referred to here is image data specified using **d1** through **dk** of Function 67.
 - The printer automatically adds control information when it stores the data. The image data domain is used as the control information. Control information formats and data values vary according to function.
- Note that it is not possible to create definitions for both NV graphics data (this command) and NV bit image data (FS q). NV bit image data definitions are deleted when this command is used.
- Note that it is not possible to create definitions for both download graphics data (this command) and download bit image data (GS *). Download bit image data definitions are deleted when this command is used.
- Always execute Function 50 after executing graphics Function 112 when the standard mode is selected.

**Notes for
transmission
process:**

- Functions 65, 66 or 67 write data to a non-volatile memory. Note the following items when using the function.
 - The printer may be BUSY when storing data and will not receive any data. In this case, be sure not to transmit data from the host.
 - Excessive use of this function may destroy the non-volatile memory. As a guideline, do not use any combination of the following commands more than 10 times per day for writing data to the non-volatile memory: FS q, GS (E (part of functions), GS (L (part of functions), GS g 0, and FS g 1.
- The following restrictions apply when performing non-volatile memory operations (including data store and delete).
 - The paper cannot be fed by paper feed switch.
 - The real time command must not be executed.
 - The ASB status will not be sent, even when the ASB function is set to enable.

**Notes for
ESC/POS
Handshaking
Protocol:**

- Data send operations are performed using Functions 48, 51 and 64.
- The printer enters the BUSY state just before the data header is sent. After NUL has been sent, the printer enters the READY state (except when other factors cause it to enter the BUSY state).
- During the interval between the sending of the data header and NUL, ASB status and the real time commands are rendered invalid.
- When operating with a serial interface, be sure to configure operation so that the host computer only uses the printer when it is READY.
- When operating with a parallel interface, the data sent by this function (starting with Header and ending with NUL), as with other data, is first stored in the send buffer, then output in sequential order when the host computer changes to the reverse mode. Note that the send buffer capacity is 99 bytes, and any data exceeding this volume limit will be lost; therefore, when using this command, it is important to configure the operation so that the host computer's change to the reverse mode and the subsequent status send/ receive process is performed quickly.
- It will be necessary to perform the ESC/POS Handshaking Protocol procedures listed below when using Function 64.

| Procedure | Host operation | Printer operation |
|-----------|--------------------------------|--|
| 1 | GS (L sends Function 64. | Function 64 is initiated. |
| 2 | Data is received from printer. | Key code list is sent. |
| 3 | Response code (*1) is sent. | Procedures (*2 and *3) are performed according to response code. |

(*1) Response Code

| ASCII | Hexadecimal | Decimal | Request definition |
|-------|-------------|---------|----------------------------------|
| ACK | 0x06 | 6 | Send next data group. |
| NAK | 0x15 | 21 | Resend just-received data group. |
| CAN | 0x18 | 24 | Cancel send operation. |

(*2) Processing According to Response Code (When Send Data Remains (indicated by identification status of send data group))

| Response code | Description |
|---------------|---|
| ACK | Initiates operation to send next data. |
| NAK | Resends the just-received data. |
| CAN | Cancels processing initiated by this command. |

•

(*3) Processing According to Response Code (When No More Send Data Remains (indicated by identification status of send data group))

| Response code | Description |
|---------------|--|
| ACK, CAN | Cancels procedure initiated by this command. |
| NAK | Resends the just-received data. |

- When codes other than the ACK, NAK, or CAN codes are received, the CAN procedure is executed.
- The data lengths listed in the table below are used for storing control information for each group of graphics data contained in a domain.

| Graphics type | Control information data value |
|---------------|--------------------------------|
| NV graphics | 24 bytes |

- The following printing colors are available when a recommended 2-color thermal paper is used.

| Color selection | Printing color | Control | Remarks |
|-----------------|----------------|----------------------|---|
| Color 1 | Black | Printing high energy | |
| Color 2 | Red | Printing low energy | Cannot be selected for a single-color paper |

GS (L p_L p_H m fn (fn=48)

Code ASCII: GS (L p_L p_H m fn

Code HEX: 0x1D 0x28 0x4C 0x02 0x00 0x30 **fn**

Range: (p_L + p_H × 256) = 2 (p_L = 2, p_H = 0)

m = 48

fn = 0, 48

Description: Sends the entire capacity (specified in bytes) of the NV graphics data domain.

- This function does not require ESC/POS Handshaking Protocol.

Notes:

- This function is used to send the following data groups, beginning with the Header and ending with NUL.

| Send data | Hexadecimal | Decimal | Data length |
|----------------------|--------------|----------|--------------|
| Header | 0x37 | 55 | 1 byte |
| Identifier | 0x30 | 48 | 1 byte |
| Entire capacity (*1) | 0x30 to 0x39 | 48 to 57 | 1 to 8 bytes |
| NUL | 0x00 | 0 | 1 byte |

(*1) The entire capacity is the total byte count for that domain.

- The decimal value for the entire capacity is converted to text data and sent starting from the high order end.
Example:
If the entire capacity is 1200 bytes, the “1200” (expressed decimally as 49, 50, 48, and 48) is converted to 4-byte data.
- When this command is used to send the entire capacity, the entire byte capacity of the domain is sent, regardless of definitions currently entered for NV graphics data. The entire capacity referred to here includes the area used for control information.
- Note that the NV graphics function cannot be used when the value for the entire capacity is “0” (expressed hexadecimal as 0x30 and decimally as 48).
- The data sent using this function is distinguished from other send data by unique data inserted in each data block. When the header sent from the printer has a hexadecimal value of 0x37 and decimal value of 55, process the data up to NUL (hexadecimal value 0x00 and decimal value 0) as a single data group, using the data shown in the table below for identification.

| Send Data | Hexadecimal | Decimal |
|--------------------------|-------------|---------|
| First byte (header) | 0x37 | 55 |
| Second byte (identifier) | 0x30 | 48 |

- Note that the following procedure is required for processing the data.
 - When communication with the printer uses XON/XOFF control, the XOFF may interrupt the “Header to NUL” data string.
- The domain of the NV graphics data can be selected by using Function 5 of the GS (E command.

(Unit: byte)

| Selectable data domain | Default |
|--|---------|
| 0, 64 K, 128 K, 192 K, 256 K, 320 K, 384 K | 384 K |

If you set a combination of settings that is not possible, the entire capacity of the NV graphics memory that can be in actual use will be sent instead of the memory size set by GS (E.

GS (L p_L p_H m fn (fn=51)

Code ASCII: GS (L p_L p_H m fn

Code HEX: 0x1D 0x28 0x4C 0x02 0x00 0x30 **fn**

Range: (p_L + p_H × 256) = 2 (p_L = 2, p_H = 0)

m = 48

fn = 3, 51

Description: Sends the unused capacity in the NV graphics domain.

- This function does not require ESC/POS Handshaking Protocol.

Notes:

- This function is used to send the following data groups, beginning with the Header and ending with NUL.

| Send data | Hexadecimal | Decimal | Data length |
|----------------------|--------------|----------|--------------|
| Header | 0x37 | 55 | 1 byte |
| Identifier | 0x31 | 49 | 1 byte |
| Unused capacity (*1) | 0x30 to 0x39 | 48 to 57 | 1 to 8 bytes |
| NUL | 0x00 | 0 | 1 byte |

(*1) The unused capacity is the total byte count for the unused area.

- The decimal value for the unused capacity is converted to text data and sent starting from the high order end.

Example:

If the available capacity is 120 bytes, the “120” (expressed decimally as 49, 50, and 48) is converted to 3-byte data.

- The control information for NV graphics data is included in the capacity in use.

- The unused capacity data in the NV graphics domain is distinguished from other send data by unique data inserted in each data block. When the header sent from the printer has a hexadecimal value of 0x37 and

decimal value of 55, process the data up to NUL (hexadecimal value 0x00 and decimal value 0) as a single data group, using the data shown in the table below for identification.

| Send Data | Hexadecimal | Decimal |
|--------------------------|-------------|---------|
| First byte (header) | 0x37 | 55 |
| Second byte (identifier) | 0x31 | 49 |

- Note that the following procedures are required for processing the data.
 - When communication with the printer uses XON/XOFF control, the XOFF may interrupt the “Header to NUL” data string.
- Do not use this function in conjunction with NV bit images (FS q).
- The domain of the NV graphics data can be selected by using Function 5 of the GS (E command.

(Unit: byte)

| Selectable data domain | Default |
|--|---------|
| 0, 64 K, 128 K, 192 K, 256 K, 320 K, 384 K | 384 K |

An area of 24 bytes is used for the control information for each item of NV graphics.

- Each graphics needs an header with 18 (12 +6) Byte. The memory which one graphics need can calculated by: $\text{INT}(((\text{graphics size} + 18) + 3) / 4) * 4$
- NV-Memory for GS (L graphics is shared with other graphics (ESC (+*.BMP file), GS *, GS 0x84)

GS (L p_L p_H m fn d1 d2 (fn=64)

Code ASCII: GS (L p_L p_H m fn d1 d2
Code HEX: 0x1D 0x28 0x4C 0x04 0x00 0x30 0x40 0x4B 0x43
Range: (p_L + p_H × 256) = 4 (p_L = 4, p_H = 0)
m = 48
fn = 64
d1 = 75
d2 = 67

Description: Sends the key codes for NV graphics data that has been defined using Function 67.

- This function does require ESC/POS Handshaking Protocol.

Notes:

- When key codes are present, the data shown below (beginning with Header and ending with NUL) is sent.

| Send data | Hexadecimal | Decimal | Data length |
|------------------------------------|--------------|-----------|---------------|
| Header | 0x37 | 55 | 1 byte |
| Identifier | 0x72 | 114 | 1 byte |
| Identification status (*1) (*2) | 0x40 or 0x41 | 64 or 65 | 1 byte |
| Data (*3) | 0x20 to 0x7E | 32 to 126 | 2 to 80 bytes |
| NUL | 0x00 | 0 | 1 byte |

(*1) When the number of NV graphics data groups exceeds 40, the groups are divided into blocks in compliance with the following conventions:

- When unsent data is present, the Identification status byte (byte 3) is set to hexadecimal value 0x41 and decimal value 65.
- When unsent data is not present, the Identification status byte (byte 3) is set to hexadecimal value 0x40 and decimal value 64.

(*2) If the number of NV graphics data groups is 40 or less, they are sent in a single batch, with the Identification status byte (byte 3) set to hexadecimal value 0x40 and decimal value 64.

(*3) The data groups are arranged according to the key codes.

- When no key codes are present, the data shown below (beginning with Header and ending with NUL) is sent.

| Send data | Hexadecimal | Decimal | Data length |
|-----------------------|-------------|---------|-------------|
| Header | 0x37 | 55 | 1 byte |
| Identifier | 0x72 | 114 | 1 byte |
| Identification status | 0x40 | 64 | 1 byte |
| NUL | 0x00 | 0 | 1 byte |

- The key codes list data in the NV graphics is distinguished from other send data by unique data inserted in each data block. When the header sent from the printer has a hexadecimal value of 0x37 and decimal value of 55, process the data up to NUL (hexadecimal value 0x00 and decimal value 0) as a single data group, using the data shown in the table below for identification.

| Send Data | Hexadecimal | Decimal |
|--------------------------|-------------|---------|
| First byte (header) | 0x37 | 55 |
| Second byte (identifier) | 0x72 | 114 |

- Note that the following procedures are required for processing the data.
 - When communication with the printer uses XON/XOFF control, the XOFF may interrupt the “Header to NUL” data string.
 - Do not use this function in conjunction with NV bit images (FS q).

GS (L p_L p_H m fn d1 d2 d3 (fn=65)

Code ASCII: GS (L p_L p_H m fn d1 d2 d3
Code HEX: 0x1D 0x28 0x4C 0x05 0x00 0x30 0x41 0x43 0x4C 0x52
Range: (p_L + p_H × 256) = 5 (p_L = 5, p_H = 0)
 m = 48
 fn = 65
 d1 = 67
 d2 = 76
 d3 = 82

Description: Deletes NV graphics data that has been defined using Function 67.

- Deleted areas are designated “Unused areas.”
- All key codes are designated as undefined.

- Notes:**
- Use this function at the beginning of the line when the standard mode is selected.
 - This function is incompatible with macros, so be sure to avoid including it when defining macros.
 - When NV graphics data is being shared by multiple applications, executing this function will delete all data being used by all applications. Caution is required when using this function.

GS (L p_L p_H m fn kc1 kc2 (fn=66)

Code ASCII: GS (L p_L p_H m fn kc1 kc2

Code HEX: 0x1D 0x28 0x4C 0x04 0x00 0x30 0x42 **kc1** **kc2**

Range: (p_L + p_H × 256) = 4 (p_L = 4, p_H = 0)

m = 48

fn = 66

32 ≤ **kc1** ≤ 126

32 ≤ **kc2** ≤ 126

Description: Deletes NV graphics data that has been defined using key codes **kc1** and **kc2**.

- Deleted areas are designated “Unused areas.”
- Deleted key codes are designated as undefined.

Notes:

- Use this function at the beginning of the line when the standard mode is selected.
- This function is incompatible with macros, so be sure to avoid including it when defining macros.

GS (L p_L p_H m fn a kc1 kc2 b x_L x_H y_L y_H [c d1...dk]1...[c d1...dk]b (fn=67)

Code ASCII: GS (L p_L p_H m fn a kc1 kc2 b x_L x_H y_L y_H [c d1...dk]1...[c d1...dk]b
Code HEX: 0x1D 0x28 0x4C p_L p_H 0x30 0x43 0x30 kc1 kc2 b x_L x_H y_L y_H [c d1...dk]1...[c d1...dk]b

Range: $12 \leq (p_L + p_H \times 256) \leq 40972$
 $(0 \leq p_L \leq 255, 0 \leq p_H \leq 255)$
m = 48,
fn = 67,
a = 48
 $32 \leq kc1 \leq 126$
 $32 \leq kc2 \leq 126$
b = 1, 2 (when the recommended two-color paper is used)
b = 1 (when the recommended monochrome paper is used)
 $1 \leq (x_L + x_H \times 256) \leq 8192$ ($0 \leq x_L \leq 255, 0 \leq x_H \leq 32$)
 $1 \leq (y_L + y_H \times 256) \leq 2304$ ($0 \leq y_L \leq 255, 0 \leq y_H \leq 9$)
c = 49, 50 (when the recommended two-color paper is used)
c = 49 (when the recommended monochrome paper is used)
 $0 \leq d \leq 255$
 $k = (\text{int}((x_L + x_H \times 256) + 7)/8) \times (y_L + y_H \times 256)$
 $p_L + p_H \times 256 = (x_L + x_H \times 256) \times (y_L + y_H \times 256) / 8 + 10 + b$

Description: Defines items of NV graphics data (d1 ... dk) corresponding to key codes (kc1 and kc2) in non-volatile memory.

- Switch **b** is used to specify the number of colors for NV graphics.
- **x_L** and **x_H** specify the horizontal size of NV graphics in units of dots (**x_L** + **x_H** × 256).
- **y_L** and **y_H** specify the vertical size of NV graphics in units of dots (**y_L** + **y_H** × 256).
- Switch **c** is used to specify the color of the defined data.

| c | Color specifications |
|----|----------------------|
| 49 | Color 1 |
| 50 | Color 2 |

- Switch **d** is used to specify the defined data for NV graphics. This data is processed in raster format.
- Switch **k** is used to indicate the defined data value. It is not necessary to send parameter **k** because it is a descriptive parameter.
- In cases where the specified key code already exists in memory, it will be necessary to overwrite the data.

- Notes:**
- NV graphics indicate image data groups defined in the printer's internal non-volatile memory. Data definitions for NV graphics data created using this command are valid until redefined by this command.
 - This function is used to define NV graphics data.

- Use this function at the beginning of the line when the standard mode is selected.
- This function is incompatible with macros, so make sure to avoid including it when defining macros.
- The [data value (**k**) + control information data value] area of the NV graphics data domain is used when this function is executed.
- In cases where there is insufficient capacity available for storing NV graphics data, this function cannot be used. Use Function 51 to confirm the available capacity in the NV graphics data area.
- One option is to delete items of NV graphics data that were previously defined to the same key code.
- The data for byte **k** of **d1 ... dk** is processed as a single item of defined NV graphics data. The defined data (**d**) specifies “1” for bits corresponding to dots that will be printed and “0” for bits corresponding to dots that will not be printed.
- Specify single data groups [**c d1 ... dk**] when monochrome is selected (**b** = 1) as the color.
- Specify **b** number of data groups [**c d1 ... dk**] when multiple colors are selected (**b** ≠ 1). It is also important to specify different colors in units of data groups when specifying color I.
- NV graphics data is printed using Function 69.
- Note that it is not possible to create definitions for both NV graphics data (this command) and NV bit image data (FS q). NV bit image data definitions are deleted when this command is used.
- The relationship between NV graphics data (raster format) and print results is shown in the table below.

| | | | |
|-------------|-------------|-------------|-------------|
| d1 | d2 | ... | dx |
| dx+1 | dx+2 | ... | dx*2 |
| : | : | ... | : |
| | dk-2 | dk-1 | dk |
| MSB | MSB | MSB | MSB |
| LSB | LSB | LSB | LSB |

$$X = (xL + xH \times 256)$$

- For specifying paper (2-color/single-color), see Functions 5 and 6 of GS (E. Domain of the NV graphics data can be selected as follows by using Function 5 of GS (E. (Unit: bytes)

| Selectable data domain | Default |
|--|---------|
| 0, 64 K, 128 K, 192 K, 256 K, 320 K, 384 K | 384 K |

An area of 24 bytes is used for the control information for each item of NV graphics.

GS (L p_L p_H m fn kc1 kc2 x y (fn=69)

Code ASCII: GS (L p_L p_H m fn kc1 kc2 x y
Code HEX: 0x1D 0x28 0x4C 0x06 0x00 0x30 0x45 **kc1** **kc2** **x** **y**

Range: (p_L + p_H × 256) = 6 (p_L = 6, p_H = 0)
m = 48
fn = 69
32 ≤ **kc1** ≤ 126
32 ≤ **kc2** ≤ 126
x = 1, 2
y = 1, 2

Description: Prints items of NV graphics data defined using key codes **kc1** and **kc2**.
• Users have the option of specifying horizontal (times **x**) × vertical (times **y**) size settings for the selected data.

Notes:

- This function is used to print NV graphics data defined using Function 67 of this command.
- The printer only prints when NV graphics data corresponding to the specified key code is present.
- Use this command when the printer enters the “Beginning of line” or “No data in print buffer” state during standard mode.
- Note that during page mode, printing operations will not be performed simply because image data has been stored to the print buffer.
- NV graphics data that exceeds the print area for one line will not be printed.
- Settings for text effect (bold, underline, orientation) and font size do not affect the printing of the NV graphics data.
- Feeds the paper the required distance when printing graphics data, regardless of line feed pitch settings entered using the Set line feed command.
- Moves print position to the left side of the printing area after printing of graphics data is completed. The printer then enters the “Beginning of line” or “No data in print buffer” state.
- The dot density and the maximum print area are described in the next tables (number of dots for each dpi:25.4 mm).
- “Vertical” is in the direction of paper feeding and “horizontal” is perpendicular (at right angles) to the direction of paper feeding.
- “Dot density” and “Maximum print area (dot)” are the values by the specification of standard size (1 × 1). The dot density doubles when horizontal magnification (x) or length magnification (y) is doubled and the maximum print area becomes ½.
- A horizontal maximum print area is the information used when printing the graphics in either of the following conditions.
a) When the standard mode is selected
b) When the page mode is selected
(For the starting point specified with ESC T is “Upper left” or “Lower right”.)

- The maximum print area in the vertical direction is information used when graphics are printed with the page mode selected (for the starting point specified with ESC T is “Upper right” or “Lower left”). In this case, bit images rotated by 90 degrees or 270 degrees are printed.
- See Functions 5 and 6 of GS (E for the paper width and paper (two-color paper / monochrome paper).
- See Functions 3 and 4 of GS (E for the memory switch.

| Vertical | | | Horizontal | |
|-------------|--------------------------|---------------------|-------------|--------------------------|
| Dot density | Maximum print area (dot) | | Dot density | Maximum print area (dot) |
| | Paper width 80 mm | Paper width 57.5 mm | | |
| 203 dpi | 576 | 408 | 203 dpi | 1662 |

GS (k p_L p_H cn fn [parameters]

Code ASCII: GS (k p_L p_H cn fn
Code HEX: 0x1D 0x28 0x6B p_L p_H cn fn
Range: $2 \leq (p_L + p_H \times 256) \leq 65530$ ($0 \leq p_L \leq 255$, $0 \leq p_H \leq 255$)
cn = 48, 49, 51
fn = 65, 66, 67, 68, 69, 70, 80, 81, 82

Description:

| cn | fn | Function name |
|----|----|--|
| 0 | 0 | All: Erase symbol storage area |
| 48 | 65 | PDF417: Set the number of columns in the data region |
| | 66 | PDF417: Set the number of rows in the data region |
| | 67 | PDF417: Set the width of the module |
| | 68 | PDF417: Set the row height |
| | 76 | PDF417: Set ratio of width to height |
| | 80 | PDF417: Store the data into the symbol storage area |
| | 81 | PDF417: Print the symbol data in the symbol storage area |
| 49 | 65 | QR Code: Select the model |
| | 67 | QR Code: Set the size of module |
| | 69 | QR Code: Select the error correction level |
| | 80 | QR Code: Store the data into the symbol storage area |
| | 81 | QR Code: Print the symbol data in the symbol storage area |
| 51 | 72 | GS 1 Databar: Set count of modules for GS 1 DataBar Expanded |

Notes:

- TH230+ only, **Firmware 01.07 or newer**

GS (k p_L p_H cn fn (cn = 0, fn = 0)

- Code ASCII:** GS (k p_L p_H 0 0
- Code HEX:** 0x1D 0x28 0x6B p_L p_H 0x00 0x00
- Range:** (p_L + p_H × 256) = 2 (p_L = 2, p_H = 0)
 cn = 0
 fn = 0
- Description:** Erase symbol storage area.
- Notes:**
- TH230+ only, **Firmware 01.07 or newer**
 - All data in symbol storage area will be erased
 - Memory in RAM-area for fonts and images will be free

GS (k p_L p_H cn fn n (cn = 0, fn = 1)

- Code ASCII:** GS (k p_L p_H 0 1 n
- Code HEX:** 0x1D 0x28 0x6B p_L p_H 0x00 0x01 n
- Range:** (p_L + p_H × 256) = 3 (p_L = 3, p_H = 0)
 cn = 0
 fn = 1
 48 ≤ n ≤ 50
- Description:** Transmit symbol storage area.
- n signs the barcode type which should be read out. If the type not equal to the stored barcode, nothing will be transmit.

| n | Barcode |
|----|---------|
| 48 | PDF417 |
| 49 | QR |

Printer transmit follow data

| Transmit data | Hex | Decimal |
|---|-----------|---------|
| 1. byte (header) | 0x37 | 55 |
| 2. byte (identifier) | 0x28 | 33 |
| 3. byte (identifier2) | 0x6B | 107 |
| 4. byte (transmit length (low byte)) | 0x00-0xFF | 0-255 |
| 5. byte (transmit length (high byte)) | 0x00-0xFF | 0-255 |
| 6. – (low byte + high byte * 265) bytes (transmit content) | 0x00-0xFF | 0-255 |

- Notes:**
- TH230+ only, **Firmware 01.07 or newer**
 - Return all data from symbol area

GS (k p_L p_H cn fn n (cn = 48, fn = 67)

Code ASCII: GS (k p_L p_H 0 C n
Code HEX: 0x1D 0x28 0x6B p_L p_H 0x30 0x43 n
Range: (p_L + p_H × 256) = 3 (p_L = 3, p_H = 0)
 cn = 48
 fn = 67
 1 ≤ n ≤ 7 (3 default)

Description: Set the module width of PDF417 Barcode
 n is the width of a single module in dots.

Notes:

- TH230+ only, **Firmware 01.07 or newer**
- The height of module is 2 times of the setted width

GS (k p_L p_H cn fn m d1 ... dk (cn = 48, fn = 80)

Code ASCII: GS (k p_L p_H 0 P 0 d1...dk
Code HEX: 0x1D 0x28 0x6B p_L p_H 0x30 0x50 0x30 d1...dk
Range: 4 ≤ (p_L + p_H × 256) ≤ 5424 (0 ≤ p_L ≤ 255, 0 ≤ p_H ≤ 255)
 cn = 48
 fn = 80
 m = 48
 0 ≤ d ≤ 255
 k = (p_L + p_H × 256) - 3

Description: Stores the PDF417 symbol data (d1...dk) in the symbol storage area.
 The printer will respond to the command being sending ACK (0x06) or NAK (0x15).

Notes:

- TH230+ only, **Firmware 01.07 or newer**
- Storage area will be taken from RAM – Font memory. If there is no memory free, command will be ignored.
- Storage can be freed with
- GS (k p_L p_H cn fn (cn = 0, fn = 0)
- The using of full possible size depends from the content of PDF417. The maximum of possible bytes are 5420, but the mximum of used PDF417 codewords are 926. The errorlevel is fixed by 1.

GS (k p_L p_H cn fn m (cn = 48, fn = 81)

Code ASCII: GS (k p_L p_H 0 Q 0
Code HEX: 0x1D 0x28 0x6B p_L p_H 0x30 0x51 0x30
Range: (p_L + p_H × 256) = 3 (p_L = 3, p_H = 0)
 cn = 48
 fn = 81
 m = 48

Description: Encodes and print the PDF417 symbol data in the symbol storage area.

- Notes:**
- TH230+ only, **Firmware 01.07 or newer**
 - Command is only valid at start of line! All characters after GS k are used as normal characters, if command not used at start of line.
 - Command works only if PF417 data stored in symbol area

GS (k p_L p_H cn fn n1 n2 (cn = 49, fn = 65)

Code ASCII: GS (k p_L p_H 1 A n1 n2
Code HEX: 0x1D 0x28 0x6B p_L p_H 0x31 0x41 n1 n2
Range: (p_L + p_H × 256) = 4 (p_L = 4, p_H = 0)
 cn = 49
 fn = 65
 n1 = 50
 n2 = 0

Description: Selects the model for QR-Code

| n1 | Function |
|----|-----------------------------|
| 50 | Selects QR Model 2 encoding |

- Notes:**
- TH230+ only, **Firmware 01.07 or newer**

GS (k p_L p_H cn fn n (cn = 49, fn = 67)

Code ASCII: GS (k p_L p_H 1 C n
Code HEX: 0x1D 0x28 0x6B p_L p_H 0x31 0x43 n
Range: (p_L + p_H × 256) = 3 (p_L = 3, p_H = 0)
 cn = 49
 fn = 67
 1 ≤ n ≤ 8 (3 default)

Description: Sets the size of the module for QR Code to n dots.

- Notes:**
- TH230+ only, **Firmware 01.07 or newer**
 - ESC @ set the symbol size to default

GS (k p_L p_H cn fn n (cn = 49, fn = 69)**Code ASCII:** GS (k p_L p_H 1 E n**Code HEX:** 0x1D 0x28 0x6B p_L p_H 0x31 0x45 n**Range:** (p_L + p_H × 256) = 3 (p_L = 3, p_H = 0)

cn = 49

fn = 69

48 ≤ n ≤ 51 (48 default)

Description: Selects the error correction level for QR Code

| n | Function | Ability for Reconstruction |
|----|---------------------------------|----------------------------|
| 48 | Select error correction level L | 7% |
| 49 | Select error correction level M | 15% |
| 50 | Select error correction level Q | 25% |
| 51 | Select error correction level H | 30% |

Notes:

- TH230+ only, **Firmware 01.07 or newer**
- ESC @ set the error correction level to default

GS (k p_L p_H cn fn n (cn = 49, fn = 70)**Code ASCII:** GS (k p_L p_H 1 F n**Code HEX:** 0x1D 0x28 0x6B p_L p_H 0x31 0x46 n**Range:** (p_L + p_H × 256) = 3 (p_L = 3, p_H = 0)

cn = 49

fn = 70

0 ≤ n ≤ 4, 48 ≤ n ≤ 52 (0,48 default)

Description: Encoding modes

| n | Function |
|------|--|
| 0,48 | Encode lower-case alphabet characters in 8-bit mode |
| 1,49 | Ignore case distinctions and use only upper case characters |
| 2,50 | Encode lower-case alphabet characters in 8-bit mode Assume that the input contains kanji (shift-jis) |
| 3,51 | Ignore case distinctions and use only upper case characters Assume that the input contains kanji (shift-jis), |
| 4,52 | Encode entire data in 8-bit mode |

Notes:

- TH230+ only, **Firmware 01.07 or newer**
- ESC @ set the encoding mode to default

GS (k p_L p_H cn fn m d1 ... dk (cn = 49, fn = 80)

Code ASCII: GS (k p_L p_H 1 P 0 d1...dk
Code HEX: 0x1D 0x28 0x6B p_L p_H 0x31 0x50 0x30 d1...dk
Range: $4 \leq (p_L + p_H \times 256) \leq 7092$ ($0 \leq p_L \leq 255, 0 \leq p_H \leq 27$)
cn = 49
fn = 80
m = 48
 $0 \leq d \leq 255$
 $k = (p_L + p_H \times 256) - 3$

Description: Stores the QR symbol data (d1...dk) in the symbol storage area.

- Notes:**
- TH230+ only, **Firmware 01.07 or newer**
 - Storage area will be taken from RAM – Font memory. If there is no memory free, command will be ignored.
 - Storage can be freed with GS (k p_L p_H cn fn (cn=0, fn=0)
 - Max. encodable data depends on selected error level:

| | |
|---------------|------|
| ERROR LEVEL L | 1273 |
| ERROR LEVEL M | 1058 |
| ERROR LEVEL Q | 804 |
| ERROR LEVEL H | 625 |

GS (k p_L p_H cn fn m (cn = 49, fn = 81)

Code ASCII: GS (k p_L p_H 1 Q 0
Code HEX: 0x1D 0x28 0x6B p_L p_H 0x31 0x51 0x30
Range: $(p_L + p_H \times 256) = 3$ ($p_L = 3, p_H = 0$)
cn = 49
fn = 81
m = 48

Description: Encodes and prints the QR symbol data in the symbol storage area.

- Notes:**
- TH230+ only, **Firmware 01.07 or newer**
 - Command is only valid at start of line! All characters after GS k are used as normal characters, if command not used at start of line.
 - Command works only if PF417 data stored in symbol area
 - If the command failed, ask the error code with ESC w n _ g e t _ l a s t _ e r r o r

GS (k p_L p_H cn fn (cn = 51, fn = 72)

Code ASCII: GS (k p_L p_H 3 H n

Code HEX: 0x1D 0x28 0x6B p_L p_H 0x33 0x48 n

Range: (p_L + p_H × 256) = 3 (p_L = 3, p_H = 0)

cn = 51

fn = 72

n = 2, 4, 6, 8, 10, 12, 14, 16 (8 default)

Description: Specifies the count of Data-Segments in one Line. Contains the barcode more Segments, the barcode will be wrapped.

If the expand code used with composite code, 4 segments are the minimum. Less than 4 segments, the barcode will not be printed.

Count of segments has to be even. Otherwise setting will be discarded.

If barcode with set segments to wide for print area, barcode will not be printed.

Notes:

- TH230+ only, **Firmware 01.07 or newer**

GS *

Function: Define downloaded bit image

Code ASCII: GS * x y d1...dk

Code HEX: 0x1D 0x2A x y d1...dk

Range:
 $1 \leq x \leq 80$
 $1 \leq y \leq 64$ ($1 \leq x \times y \leq 5120$)
 $0 \leq d \leq 255$
 $k = x \times y \times 8$

Description: Defines a downloaded bit image.

- **x** specifies ($x \times 8$) dots in the horizontal direction, and **y** specifies ($y \times 8$) dots in the vertical direction (see notes).
- **d** indicates the bit image data.
- **k** indicates the number of the definition data. **k** is a parameter for an explanation; therefore, it is not necessary to be transmitted.

Recommended Functions: It is recommended that downloaded graphics function (GS (L / GS 8 L: <Function 52 > and <Function 80 > ~ <Function 85>) be used because it offers the following additional features:

- Multiple number of logo data and mark data can be specified.
- Data control by key code is possible.
- Redefining or deleting the same data is possible.
- Selecting a color for printing is possible.
- Defining data by raster format is possible.
- The remaining capacity of the definition area can be confirmed.

- Notes:**
- Pixel data are arranged column by column. For each **x**, $8 \times x$ columns are needed (if **y** = 1, 8 bytes are necessary). For each **y**, 8 vertically dots will be defined.
 - Data (**d**) specifies a bit printed to 1 and not printed to 0.
 - The downloaded bit image is not defined at the default.
 - Once a downloaded bit image has been defined, it is available until another definition is made, ESC & or ESC @ is executed, the printer is reset, or the power is turned off.
 - A downloaded bit image and a user-defined character cannot be defined simultaneously.
 - When this command is executed, the user-defined character is cleared.
 - When ESC & is executed, the user-defined character is cleared.
 - The downloaded bit image is printed by GS /.

- The relationship between bit image data and print result is as follows.T

| | | | | | | |
|-------|-----------------|-----|--|-----|-------------------------------|-----|
| d_1 | d_{y+1} | ... | $d_{y \cdot 7 + 1}$ | ... | d_{k-3} | MSB |
| | | | | | | LSB |
| d_2 | d_{y+2} | ... | $d_{y \cdot 7 + 2}$ | ... | d_{k-2} | MSB |
| | | | | | | LSB |
| . | . | ... | | ... | d_{k-1} | MSB |
| . | . | | | | | LSB |
| d_y | $d_{y \cdot 2}$ | ... | $d_{y \cdot 8} =$ $d_{f(x=1) =}$ $d_{x \cdot 8 \cdot y}$ | ... | $d_k = d_{x \cdot 8 \cdot y}$ | MSB |
| | | | | | | LSB |

- A downloaded bit image and a user-defined character cannot be defined simultaneously when memory switch 8-7 is ON. See Functions 3 and 4 of GS (E for the memory switch.

GS /

Function: Print downloaded bit image

Code ASCII: GS / m

Code HEX: 0x1D 0x2F m

Range: $0 \leq m \leq 3$, $48 \leq m \leq 51$

Description: Prints a downloaded bit image using the mode specified by m, as follows:

| m | Mode |
|-------|---------------|
| 0, 48 | Normal |
| 1, 49 | Double-width |
| 2, 50 | Double-height |
| 3, 51 | Quadruple |

Recommended Functions: It is recommended that NV graphics function (GS (L/GS 8 L: <Function 52> and <Function 80> ~ <Function 85>) be used because it offers the following additional features:

- Multiple logo data and mark data can be specified. (except for some models)
- Data can be controlled by key code.
- Redefining or deleting the same data is possible.
- Color can be specified for the definition data.
- Data can be defined by raster format.
- The remaining capacity of definition area can be confirmed.

Notes:

- This command is ignored if a downloaded bit image has not been defined.
- When standard mode is selected, this command is enabled only when there is no data in the print buffer. If data exists in the print buffer, the printer processes **m** as normal data.
- When page mode is selected, this command develops the downloaded bit image data in the print buffer but the printer does not print the downloaded bit image data.
- If a downloaded bit image exceeds one line, the excess data is not printed.
- This command feeds as much paper as is required to print the downloaded bit image, regardless of the line spacing specified by ESC 2 or ESC 3.
- The downloaded bit image is not affected by print mode (emphasized, double-strike, underline, character size, white/black reverse printing, or 90° clockwise-rotated upside-down printing mode).
- The downloaded bit image is defined by GS *.
- Downloaded bit image is printed in the default dot density (dot density of vertical and horizontal direction in normal mode) defined by GS L <Function 49>.
- After printing the downloaded bit image, the printing position is set to the left of the printing area. The printer is in the beginning of a line and data is not in the print buffer.
- Modes that can be specified and relation of the magnification of the print result are as follows:

This printer does not support the GS (L/GS 8 L graphics function. The values of [Dot Density] and [Maximum Print Area (dot)] are the same as for graphics function GS (L/GS 8 L of Function 69.

| M | Mode | Magnification | |
|-------|---------------|---------------|---------|
| | | Width | Height |
| 0, 48 | Normal | 1 times | 1 times |
| 1, 49 | Double-width | double | 1 times |
| 2, 50 | Double-height | 1 times | double |
| 3, 51 | Quadruple | double | double |

GS :

Function: Start/end macro definition

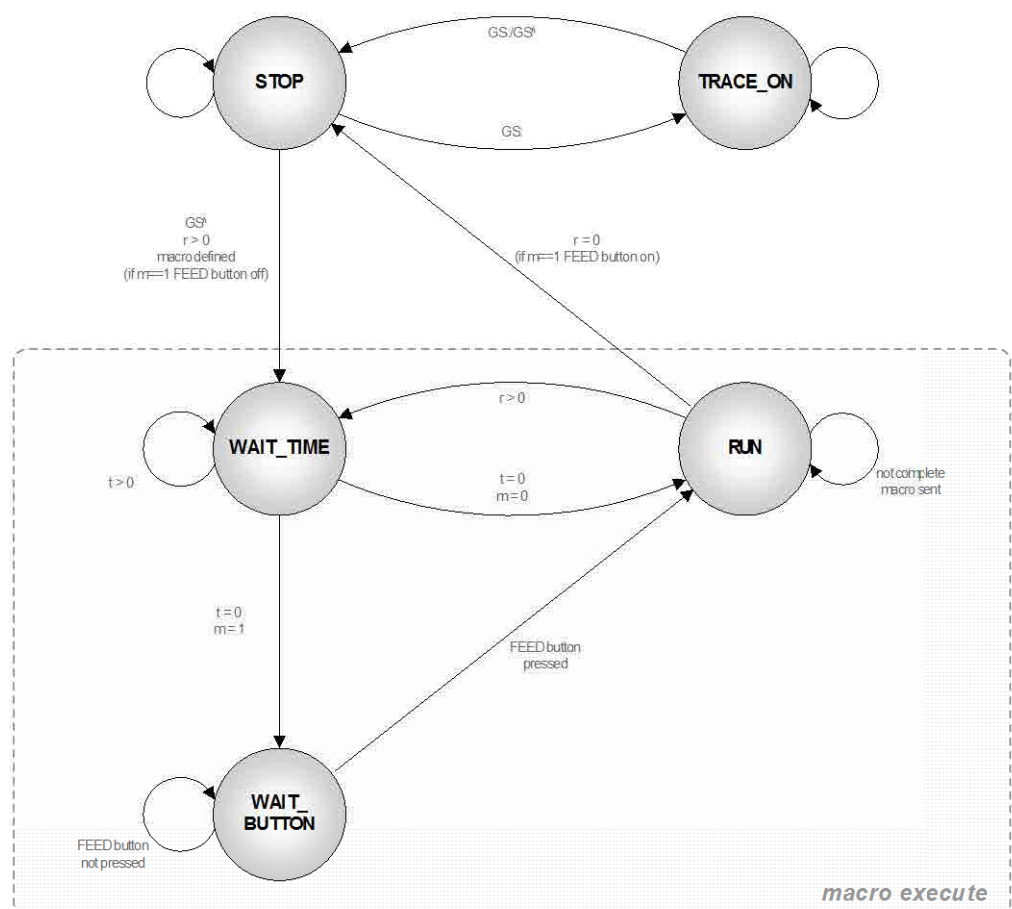
Code ASCII: GS :

Code HEX: 0x1D 0x3A

Description: Starts or ends macro definition.

Notes:

- Macro definition starts when this command is received during normal operation and ends when it is processed during macro definition.
- While the macro is defined, the printing is also executed.
- The maximum number of data is limited to 2048 bytes. All exceeded data bytes are not stored.
- If the printer processes GS : again immediately after previously processing it, the printer clears the definition.
- Macro is not defined when the power is turned on.
- The defined contents of the macro are not cleared by ESC @. Defined content of the macro is effective until the printer is reset, or the power is turned off.
- The macro is executed by GS ^.



GS @

Function: Erase User Flash/RAM Sector

Code ASCII: GS @ n

Code HEX: 0x1D 0x40 n

Range: $49 \leq n \leq 50$ (TH230)
 $49 \leq n \leq 51$ (TH230+)

Description: n = 49 (ASCII n = 1)

This command erases all 64K Flash Memory sectors allocated to user-defined character and logos storage in Flash . Those sectors should be erased only in one situation: when the logo definition area is full and an application is attempting to define new logos. In both cases, all logos and character set definitions are erased and must be redefined.

n = 50 (ASCII n = 2)

This command erases all sectors available for user data storage.

n = 51 (ASCII n = 3) (TH230+ only)

This command erases all sectors available for user-defined character and logos storage in RAM.

Printer returns NAK(0x15) if erase failure or READY (0x0D) if erase is finished

Notes:

- Erases a page of Flash Memory and sends a carriage return when the operation is complete.
- **Important:** While erasing Flash Memory, the printer disables all interrupts, including communications. To provide feedback to the application, the printer responds to the application when the erase is complete. After sending the Erase User Flash Sector (GS @ n) command, an application should wait for the response from the printer before sending data. Otherwise, data will be lost. If an application is unable to receive data, it should wait a minimum of five seconds after sending the Erase User Flash Sector (GS @ n) command before sending data.

Reference: See command “Flash Memory User Sectors Allocation” (GS “ U n1 n2).

GS B

Function: Turn white/black reverse printing mode on/off

Code ASCII: GS B n

Code HEX: 0x1D 0x42 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Turns white/black reverse printing mode on or off.

- When the LSB of n is 0, white/black reverse printing mode is turned off.
- When the LSB of n is 1, white/black reverse printing mode is turned on.

- Notes:**
- The white/black reverse printing mode is effective for all characters (except for HRI characters).
 - When white/black reverse printing mode is turned on, it also affects the right-side character spacing set by ESC SP.
 - When white/black reverse printing mode is turned on, it does not affect the space between lines.
 - When underline mode is turned on, the printer does not underline white/black reverse characters.
 - This command is effective until ESC @ is executed, the printer is reset, or the power is turned off.
 - In white/black reverse printing mode, characters are printed in white on a black background.

GS H

Function: Select printing position of HRI characters

Code ASCII: GS H n

Code HEX: 0x1D 0x48 n

Range: $0 \leq n \leq 3$
 $48 \leq n \leq 51$

Default: n = 0

Description: Selects whether the printer prints the HRI characters or not and printing position of HRI character when printing a bar code, using n as follows:

| n | Printing position |
|-------|-----------------------------------|
| 0, 48 | Not printed |
| 1, 49 | Above the bar code |
| 2, 50 | Below the bar code |
| 3, 51 | Both above and below the bar code |

Notes:

- HRI characters are printed using the font specified by GS f.
- This command setting is effective until performing of ESC @, reset or power-off.
- HRI character is Human Readable Interpretation character indicated with barcode.
- If parameter n is outside of the valid range the default value (n = 0) is used.

GS I**Function:** Transmit printer ID**Code ASCII:** GS I n**Code HEX:** 0x1D 0x49 n**Range:** $1 \leq n \leq 4$, $49 \leq n \leq 52$, $65 \leq n \leq 68$, $n = 70$, $n = 112$, $128 \leq n \leq 146$,
 $148 \leq n \leq 149$, $157 \leq n \leq 160$, $254 \leq n \leq 255$ **Description:** Transmit the specified printer ID.
n specifies the ID of the printer as follows:

| n | Printer ID | Specifications |
|----------|--|--|
| 1, 49 | Printer model ID | Printer model = 0x24 |
| 2, 50 | Type ID | See table below |
| 3, 51 | Firmware version ID | 1 Byte – FW version in binary format in bit 0...bit 3 |
| 4, 52 | Logo Definition | See table below |
| 65 | Firmware version | String with 6 characters “_xx.xx” |
| 66 | Manufacturer | “_WINCOR-NIXDORF” |
| 67 | Printer model | “_TH230” or “_TH230+” |
| 68 | Serial number | Serial number of the printer – String |
| 69 | ASIA-Character generator name | String with max 17 characters |
| 70 | Firmware date | String format “_DDMMYY” |
| 112 | Ignored | Ignored |
| 128 | Manufactured Board Number * | “_A”..”_Z”, “_AA”..”_AZ”, ... |
| 129 | Serial number date (Production date – set by GS (E pL pH fn d1...dn (fn=130)) | Production date string “_DDMMYY” |
| 130 | Character sets | All built in character sets of the printer (see example below) |
| 131 | Character generator name | String with max 17 characters |
| 132 | Character generator version | String with 6 characters (_xx.xx) |
| 133 | Horizontal resolution | “_203 dpi” |
| 134 | Vertical resolution | “_203 dpi” |

| | | |
|-----|--|---|
| 135 | Print line resolution | "_203 dpi" |
| 136 | Character generator checksum result | String "_OK" or "_Err" |
| 143 | Booter version | String with 6 characters "_xx.xx" |
| 144 | Loader version | String with 6 characters "_xx.xx" |
| 145 | Poweruptest version | String with 6 characters "_xx.xx" |
| 146 | Poweruptest checksum result | "_OK" or "_Err" |
| 148 | EEPROM status | "_OK" or "_Err" |
| 149 | Loader verified status | "_Verified" or "_Unverified" |
| 157 | Print Line Type | "_A" (ROHM thermal print line) or "_B" (other manufacturer) |
| 158 | Interface Board Description | String with the name of the interface board. (see example below) |
| 159 | Interface Board Type | String with the type of the interface board. For example "_02" or "_10" (see site Fehler! Textmarke nicht definiert.) |
| 160 | Number of Colors | String with the number of colors For example "_1" or "_2" |
| 161 | ASIA-Character generator name | String with max 17 characters |
| 162 | ASIA-Character generator version | String with 6 characters (_xx.xx) |
| 163 | ASIA-Character generator checksum result | String "_OK" or "_Err" |
| 254 | Sensor Plug Info | String "_xxxxxxx" (See table below) |
| 255 | Measured Mark Distance | String with max. 12 characters "_xxxxx steps" |

* **TH230** (predecessor of TH230+) sends the Bare PCB Number ("_A".. "_Z")

Notes:

- The ID of the printer is transmitted when the data in the receive buffer is developed. Therefore, there may be a time lag between receiving this command and transmitting the status, depending on the receive buffer status. This means that this command is **no real time command**. Therefore this command doesn't work while the printer is in the Offline State.
- **n = 1, 2, 3:** In this case the printer sends 1 byte of data.

n ≥ 65: When send printer information (character string) is specified, the printer sends the “Header to NUL” character string.

Notes for the printer information:

- Each printer information is composed of [header + printer information + NUL] (when **n** ≥ 65).

| Send data | Hexadecimal | Decimal | Data |
|---------------------|----------------------------|----------------------------|---------------|
| Header | 0x5F | 95 | 1 byte |
| Printer information | Depends on the information | Depends on the information | 1 to 80 bytes |
| NUL | 0x00 | 0 | 1 byte |

- If the printer information is not prepared, [Header + NUL] (2 bytes) are sent.
- Be sure to use this function when the host can receive data.
- When using GS I, GS (E or GS g 2 together with Automatic Status Back (ASB status, the status transmitted must be differentiated according to table Transmit Status Identification (see page 196).
- When **n** is out of the specified range, this command is ignored.
- The Firmware version may be changed.
- The firmware version can be confirmed by self test printing. Self test is executed by panel switch operation when power is turned on.
- Printer information is distinguished from other send data by the header of the block data. When the data sent from printer after printing GS I is [Hex = 0x5F / Decimal = 95], process the data to NUL [Hex = 0x00 / Decimal = 0].
- When communicating with printer by XON/XOFF control, XOFF code might be transmitted into “Header to NUL.”
- **n** = 2 or 50 Type ID:

| Bit | Function | Value | |
|-----|----------------------------|-------------|---------|
| | | 0 | 1 |
| 0 | Multi-byte code characters | No | Yes |
| 1 | Cutter | Not mounted | Mounted |
| 2 | Mark sensor | Disabled | Enabled |
| 3 | Undefined | | |
| 4 | Not used | Fixed to 0 | |
| 5 | Undefined | | |
| 6 | Undefined | | |
| 7 | Not used | Fixed to 0 | |

- **n = 4 or 52 Logo Definition:**

| Bit | Function | Value | |
|-----|----------|------------------------------------|---------------------------------|
| | | 0 | 1 |
| 0 | Logo | No logo downloaded (SRAM or Flash) | Logo downloaded (SRAM or Flash) |
| 1 | Not used | Fixed to 0 | |
| 2 | Not used | Fixed to 0 | |
| 3 | Not used | Fixed to 0 | |
| 4 | Not used | Fixed to 0 | |
| 5 | Not used | Fixed to 0 | |
| 6 | Not used | Fixed to 0 | |
| 7 | Not used | Fixed to 0 | |

- **n = 130 Character sets:**

Example:

“_0:PC437,1:PC850,2:PC852,3:PC860,4:PC863,5:PC865,6:PC858,7:PC866,8:PC1252,9:PC862,10:PC737,11:PC874” NUL

- **n = 254 Sensor Plug Info:**

| Byte # (from left) | Sensor |
|-----------------------|-------------|
| 0 | Mark Sensor |
| 1 | Undefined |
| 2 | Undefined |
| 3 | Undefined |
| 4 | Undefined |
| 5 | Undefined |
| 6 | Undefined |
| 7 | Undefined |

| Value (ASCII) | Meaning |
|------------------|--------------------------|
| '0' | not plugged |
| '1' | plugged |
| '2' | no information available |

- **n = 158 Interface Board Description:**

Example:

“_RS232,Cash Drawer,Customer Display” NUL

Reference: Table for the Transmit Status Identification (see page 199).

GS L

Function: Set left margin

Code ASCII: GS L n_L n_H

Code HEX: 0x1D 0x4C n_L n_H

Range: $0 \leq (n_L + n_H \times 256) \leq 65535$ ($0 \leq n_L \leq 255$, $0 \leq n_H \leq 255$)

Default: $(n_L + n_H \times 256) = 0$ ($n_L = 0$, $n_H = 0$)

Description: In standard mode, sets the left margin to $(n_L + n_H \times 256) \times$ (horizontal motion unit) from the left edge of the printable area.

- Notes:**
- When standard mode is selected, this command is enabled only when processed at the beginning of the line.
 - The left margin has no effect in page mode. If this command is processed in page mode, the left margin is set and it is enabled when the printer returns to standard mode.
 - If the setting exceeds the printable area, the left margin is automatically set to the maximum value of the printable area.
 - If this command and GS W set the printing area width to less than the width of one character, the printing area width is extended to accommodate one character for the line.
 - Horizontal motion unit is used.
 - If horizontal motion unit is changed after changing left margin, left margin setting is not changed.
 - Left margin setting is effective until ESC @ is executed, the printer is reset, or the power is turned off.
 - Left margin position is left edge of the printable area. If left margin setting is changed, left edge of the printable area will move.
 - The horizontal motion unit is specified by GS P.

GS P

Function: Set horizontal and vertical motion units

Code ASCII: GS P x y

Code HEX: 0x1D 0x50 x y

Range: $0 \leq x \leq 255$
 $0 \leq y \leq 255$

Default: x = 203
y = 203

Description: Sets the horizontal and vertical motion units to 1/x and 1/y inches, respectively.

- When x = 0, the default setting of the horizontal value is used.
- When y = 0, the default setting of the vertical value is used.

- Notes:**
- The horizontal direction is perpendicular to the paper feed direction and the vertical direction is the paper feed direction.
 - The horizontal and vertical motion units indicate the minimum pitch used for calculating the values of related commands (shown on the next screen).
 - In standard mode, the following commands use x or y.
 - Commands using x: ESC SP, ESC \$, ESC \, GS L, and GS W
 - Commands using y: ESC 3, ESC J, ESC K and GS V
 - In page mode, the following commands use x or y, when the starting position is set to the upper left or lower right of the printing area using ESC T.
 - Commands using x: ESC SP, ESC \$, ESC W, ESC \ and FS S.
 - Commands using y: ESC 3, ESC J, ESC K, ESC W, GS \$, GS V, and GS \.
 - In page mode, the following commands use x or y, when the starting position is set to the upper right or lower left of the printing area using ESC T.
 - Commands using x: ESC 3, ESC J, ESC K, ESC W, GS \$, and GS \
 - Commands using y: ESC SP, ESC \$, ESC W, ESC \, FS S and GS V
 - Setting of this command is effective until ESC @ is executed, the printer is reset, or the power is turned off.
 - The calculated result from combining this command with others is truncated to the minimum value of the mechanical pitch.
 - This command does not affect the current setting values.
 - The default values equal the normal dot pitch horizontally and ½ dot pitch vertically.

GS V

Function: Select cut mode and cut paper

Code ASCII: ① GS V **m**
 ② GS V **m n**

Code HEX: ① 0x1D 0x56 **m**
 ② 0x1D 0x56 **m n**

Range: ① **m** = 0, 1, 48, 49
 ② **m** = 65, 66, 67;
 $0 \leq n \leq 255$

Description: Selects a mode for cutting paper and executes paper cutting. The value of **m** selects the mode as follows:

| m | Print mode |
|----------|---|
| 0, 48 | Executes a full cut (cuts the paper completely). |
| 1, 49 | Executes a partial cut (one point left uncut). |
| 65 | Feeds the paper forward to (cutting position + [n * vertical motion unit]) and executes a full cut (cuts the paper completely). |
| 66 | Feeds the paper forward to (cutting position + [n * vertical motion unit]) and executes a partial cut (one point left uncut). |
| 67 | Feeds the Paper forward to the cutting position, executes a full cut and feeds the paper backward to (cutting position – [n * vertical motion unit]). |

- Notes:**
- When standard mode is selected, these commands are enabled only when processed at the beginning of the line.
 - When using these commands, there is a gap between the cutting position and the printing position.
 - Function 0, 1, 48, 49: If no autocutter is installed, this command feeds the paper to the tear-off edge.
 - Function 0, 1, 48, 49: Cut is executed without feeding the print position to the cut position.
 - Function 65, 66: To cut below the last printed line set **n** to 0.
 - Function 65, 66: If **n** > 0, the printer feeds the paper to (cutting position + [**n** * vertical motion unit]) and cuts it.
 - Function 65, 66, 67: If **n** = 0, the printer feeds to the cutting position and executes a full/partial cut
 - Function 65, 66, 67: The distance between printing position and cutting position is 17 mm.
 - Function 65, 66, 67: If no autocutter is installed, the printer only feeds the paper to the tear-off edge and additionally for specified amount.
 - Function 65, 66, 67: Vertical motion unit is used for calculating a paper feed amount.

- Function 67: This function can be used for compensation of the head loss because of the distance between print line and cutting position.
- Function 67: To realize the smallest possible head loss of 5 mm set **n** to 96 steps (12mm).
- Function 67: The maximum value for backward feed is 96 steps (12 mm). This reduces the top margin from 17 mm to 5 mm.
- Function 67: programming hints see page 8.
- The vertical motion unit is specified by GS P (see page 154).
- GS V 0: If Black mark sensor is enabled this command cuts paper not at the mark position. To cut at mark positions please use GS V 65, 66 or 67.

GS W

Function: Set printing area width

Code ASCII: GS W n_L n_H

Code HEX: 0x1D 0x57 n_L n_H

Range: $0 \leq (n_L + n_H \times 256) \leq 65535$ ($0 \leq n_L \leq 255$, $0 \leq n_H \leq 255$)

Default: Entire printable area

$n_L = 64$, $n_H = 2$ (when paper width is set to 80 mm (576 dots))

$n_L = 152$, $n_H = 1$ (when paper width is set to 57.5 mm (408 dots))

Description: In standard mode, sets the printing area width to $(n_L + n_H \times 256) \times$ (horizontal motion unit).

- Notes:**
- When standard mode is selected, this command is enabled only when processed at the beginning of the line.
 - The printing area width has no effect in page mode. If this command is processed in page mode, the printing area width is set and it is enabled when the printer returns to standard mode.
 - If the [left margin + printing area width] exceeds the printable area, the printing area width is automatically set to [printable area – left margin].
 - If this command and GS L set the printing area width to less than the width of one character, the printing area width is extended to accommodate one character for the line.
 - Horizontal motion unit is used.
 - If horizontal motion unit is changed after setting the printable area width, the printable area width setting will not be changed.
 - Printable area width setting is effective until ESC @ is executed, the printer is reset, or the power is turned off.
 - The horizontal motion unit is specified by GS P.
 - See GS (E Functions 5 and 6 for specifying the paper width.

GS \

Function: Set relative vertical print position in page mode

Code ASCII: GS \ n_L n_H

Code HEX: 0x1D 0x5C n_L n_H

Range: $-32768 \leq (n_L + n_H \times 256) \leq 32767$ ($0 \leq n_L \leq 255$, $-128 \leq n_H \leq 127$)

Default: None

Description: In page mode, moves the vertical printing position to $(n_L + n_H \times 256) \times$ (vertical or horizontal motion unit) from the current position.

- Notes:**
- This command is enabled only in page mode. If this command is processed in standard mode, it is ignored.
 - The printer ignores any setting that exceeds the printing area set by ESC W.
 - A positive number specifies movement to the downward, and a negative number specifies movement to the upward. N pitch movement to the downward: $(n_L + n_H \times 256) = N$. Use the complement of N for setting N pitch movement to the upward: $(n_L + n_H \times 256) = 65536 - N$.
 - The horizontal or vertical motion unit is used for the print direction set by ESC T.
 - When the starting position is set to the upper left or lower right of the printing area using ESC T, the vertical motion unit is used.
 - When the starting position is set to the upper right or lower left of the printing area using ESC T, the horizontal motion unit is used.
 - Even if vertical or horizontal motion unit is changed after changing the printing position, the setting of printing position will not be changed.
 - The vertical or horizontal motion unit is specified by GS P.

GS ^

Function: Execute macro

Code ASCII: GS ^ **r** **t** **m**

Code HEX: 0x1D 0x5E **r** **t** **m**

Range: $1 \leq r \leq 255$

$0 \leq t \leq 255$

m = 0, 1

Default: None

Description: Executes a macro **r** times while waiting **t** × 100 msec for each macro execution, using the mode specified by **m** as follows:

- When **m** = 0, the macro executes **r** times continuously at the interval specified by **t**.
- When **m** = 1, the printer waits for the period specified by **t**, blinks the Paper LED, and then waits for the Paper feed button to be pressed. After this button is pressed, the printer executes the macro once. The printer repeats this operation **r** times.

Notes:

- Macro function is useful to print the same data repeatedly. To define a macro definition, send GS : just before and after the data desired to be repeated. And then execute macro by using GS ^ to print the same data repeatedly. Macro function eliminates the need for sending all the print data every time.
- If a macro is not defined or if **r** is 0, this command is ignored.
- Even if the panel buttons are disabled by ESC c 5, paper feed button will be enabled temporarily while printer is waiting for the button to be pressed (**m** = 1). However, paper can not be fed if the paper feed button is pressed.
- If this command is processed while a macro is being defined, the printer cancels macro definition and clears the definition.
- This command can not be contained in the macro. Do not use this command when the macro is defined.
- When **m** = 1, the Paper LED indicator blinks during a macro waiting state.
- See GS : for a state-machine!
- If the printer is in Sleep Mode the first wait time is extended by the wake-up time for state "Sleep Mode 1" and (if necessary) the power wake-up time for state "Printing Mode".

GS a

Function: Enable/disable Automatic Status Back (ASB)

Code ASCII: GS a n

Code HEX: 0x1D 0x61 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Enable or disable ASB (Automatic Status Back) and specifies the status items to include, using n as follows:

| Bit | Function | Value | |
|-----|----------------------------------|----------|---------|
| | | 0 | 1 |
| 0 | Drawer kick-out connector status | Disabled | Enabled |
| 1 | Busy status | Disabled | Enabled |
| 2 | Error status | Disabled | Enabled |
| 3 | Paper roll sensor status | Disabled | Enabled |
| 4 | Handshake customer display | Disabled | Enabled |
| 5 | Undefined | | |
| 6 | Undefined | | |
| 7 | Undefined | | |

Notes:

- ASB is the function that transmit the status of [cover open/close], [Online/Offline] from the printer automatically. It is called [ASB function] and the status is [ASB status]. If you use ASB, application can acquire the printer change in a real-time and passively.
- Select any status enabled (except n = 0) and ASB starts. Then transmit the current ASB status. After that during ASB is active, the selected enabled ASB status is transmitted whenever the status changes.
- When n = 0, ASB is disabled. During ASB is disabled, ASB status is not transmitted.
- Multiple status items can be selected.
- During ASB is active, ASB status is transmitted whenever the status changes even if ESC = is not selected.
- This command setting is effective until the printer is reset or power is turned off.
- During Block data [header – NUL] is transmitted, ASB is disabled temporarily. Therefore you can not get the printer status change through ASB status during block data [header – NUL] is transmitted.
- Basic ASB status is 4-byte configuration [first byte – fourth byte].
- If the error status is enabled, a change in the following conditions will trigger the ASB:
 - Cover
 - Cutter Error
 - Out-of-Range Printhead Temperature
 - Out-of-Range Voltage
 - Paper Exhaust
- If the busy status is enabled, a change in the following conditions will trigger the ASB:
 - Paper feed button

- Busy (RS232 interface only)

- All ASB status is represent the enabled status whenever the status changes. Therefore the disabled status items may change, because each status transmission represents the current status.
- The status bytes to be transmitted are as follows:
- First byte (printer information)

| Bit | Function | Value | |
|-----|--|------------|------|
| | | 0 | 1 |
| 0 | Not used | Fixed to 0 | |
| 1 | Not used | Fixed to 0 | |
| 2 | Drawer kick-out connector pin 3 | Low | High |
| 3 | Busy | Not Busy | Busy |
| 4 | Not used | Fixed to 1 | |
| 5 | Cover | Closed | Open |
| 6 | Paper is being fed by the paper feed button. | No | Yes |
| 7 | Not used | Fixed to 0 | |

- **Bit 3:** Busy is set when the printer enters the Offline State (see chapter [Online / Offline State Diagram](#)) or if the receive buffer is nearly full.

Exception: A change of the Busy State by receive buffer nearly full doesn't trigger an ASB message when using USB interface.

- Second byte (error information)

| Bit | Function | Value | |
|-----|------------------|------------------------------------|-------------------------------|
| | | 0 | 1 |
| 0 | Customer display | Not connected or Handshake blocked | Connected and Handshake ready |
| 1 | Undefined | | |
| 2 | Undefined | | |
| 3 | Cutter error | No error | Error occurred |
| 4 | Not used | Fixed to 0 | |
| 5 | Not used | Fixed to 0 | |
| 6 | Error | No error | Error occurred |
| 7 | Not used | Fixed to 0 | |

- **Bit 3:** If Cutter error occurs due to paper jams or the like, it is possible to recover by correcting the cause of the error and executing DLE ENQ.

• **Bit 6:** Error means Cover open, Paper out, Black mark error, Cutter error, Thermistor error, High voltage error or Low voltage error. Thermistor error is an unrecoverable error. High voltage error and Low voltage error are automatic recoverable errors!

- Please note that both bit 6 and bit 3 are set if a cutter error occurred.

• If Black Mark error occurs, it is possible to recover by correcting the cause of the error (change to mark paper for example) and executing DLE ENQ.

- Third byte (paper sensor information)

| Bit | Function | Value | |
|-----|----------------------------|---------------|----------|
| | | 0 | 1 |
| 0 | Paper roll near-end sensor | Paper present | No paper |
| 1 | Paper roll near-end sensor | Paper present | No paper |
| 2 | Paper roll end sensor | Paper present | No paper |
| 3 | Paper roll end sensor | Paper present | No paper |
| 4 | Not used | Fixed to 0 | |
| 5 | Undefined | | |
| 6 | Undefined | | |
| 7 | Not used | Fixed to 0 | |

Bit 0 and Bit 1: To avoid false reports the paper near end sensor is monitored by a 0.2 m paper feed hysteresis. That means the printer doesn't report paper near end to the host until 0.2 m paper is feed and all the time the paper near end sensor detects no paper! If the linefeed button is pressed within the hysteresis, the printer reports paper near end immediately.

- Fourth byte (paper sensor information)

| Bit | Function | Value | |
|-----|-------------------|-------------|------------|
| | | 0 | 1 |
| 0 | Sleep Mode status | Normal-Mode | Sleep Mode |
| 1 | Undefined | | |
| 2 | Undefined | | |
| 3 | Undefined | | |
| 4 | Not used | Fixed to 0 | |
| 5 | Undefined | | |
| 6 | Undefined | | |
| 7 | Not used | Fixed to 0 | |

- The printer transmits a 4-byte ASB status message without confirming whether the host can receive data. ASB status, except for the XOFF code, is always consecutive.
- ASB status can be differentiated by other transmission data by Bit 0, 1, 4, and 7 of the first byte. Process the transmitted data from the printer as ASB status which is consecutive 3 byte if it is "0xx1xx00" [x = 0 or 1]. However, the processing shown in the following is necessary in the identifying processing of ASB status.
- When processing block data [Header ~ NUL], do not identify ASB status.
- When the host communicates with the printer by XON/XOFF control, the host should process 4 bytes of data, except for the XOFF code, as ASB status. ASB status configuration is different from that of the XOFF code.
- Third byte (paper sensor information): When the paper roll cover is open, paper detection (detected by the paper roll end sensor) may be incorrect.

GS b

Function: Turn smoothing mode on/off

Code ASCII: GS b n

Code HEX: 0x1D 0x62 n

Range: $0 \leq n \leq 255$

Default: n = 0

Description: Turns smoothing mode on or off.

- When the LSB of n is 0, smoothing mode is turned off.
- When the LSB of n is 1, smoothing mode is turned on.

- Notes:**
- The smoothing mode is effective for all quadruple-size or larger characters (except for HRI characters).
 - The smoothing mode is not effective for all Asia characters.
 - This command is effective until ESC @ is executed, the printer is reset, or the power is turned off.
 - The emphasized mode is not effective if smooth mode on (GS b)
 - The italic mode is not effective if smooth mode on (GS b)

GS f

Function: Select font for HRI characters

Code ASCII: GS f n

Code HEX: 0x1D 0x66 n

Range: n = 0, 1, 48, 49

Default: n = 0

Description: Selects a font for the Human Readable Interpretation (HRI) characters when printing a bar code, using n as follows:

| N | Font of HRI characters |
|-------|------------------------|
| 0, 48 | Font A |
| 1, 49 | Font B |

- Notes:**
- The font set by this command is effective only for HRI character.
 - The composition of the character of each font is different depending on the model.
 - Configurations of font A and font B are different, depending on the printer model.
 - HRI characters are printed at the position specified by GS H.
 - HRI character is Human Readable Interpretation character indicated with barcode.
 - Character configurations
 Font A: 13 * 24 Dots
 Font B: 10 * 24 Dots

GS g 0

Function: Initialize maintenance counter

Code ASCII: GS g 0 m n_L n_H

Code HEX: 0x1D 0x67 0x30 0x00 n_L n_H

Range: m = 0

(n_L + n_H × 256) = 20, 21, 50, 52~57, 59

Description: Sets the resettable maintenance counter specified by n_L and n_H to 0.

- n_L and n_H specify a resettable maintenance counter number as (n_L + n_H × 256).

In addition, the associated change counter (if existing) is increased by one. This is only possible by n_L + n_H × 256 = 20, 21 and 50.

Example: If the Cutter is replaced and GS g 0 0 50 00 is executed, the cutter change counter CUTC is increased by one (command GS g 2 see page 166).

| Counter (n _L + n _H × 256) | Specification |
|--|---------------------------------------|
| 20 | Paper feed of 1/7.52 inch as one line |
| 21 | All fired dots |
| 50 | Cutter operations |
| 52 | Cutter Errors |
| 53 | Black Mark Errors |
| 54 | Thermistor Errors |
| 55 | Low Voltage Errors |
| 56 | High Voltage Errors |
| 57 | Cover Open Counter |
| 59 | Maximum Head Temperature |

Notes:

- In standard mode, this command is effective only when processed at the beginning of a line.
- Unsupported counter numbers cannot be specified.
- Do not use this command while a macro is being defined, because the command cannot be included in the macro.
- There are two kinds of maintenance counters: resettable counters and accumulation counters. A resettable counter is a maintenance counter that can be initialized, and an accumulation counter indicates the counter value from when the printer starts operation. An accumulation counter cannot be initialized (see GS g 2 for details of the accumulation counter.)
- Take the following into account when writing data to a non-volatile memory.
- The printer may be in BUSY state when processing this command. In this case, be sure not to send a command from the host to the printer, because the printer will not receive the command.

- Excessive use of this function may destroy the non-volatile memory. As a guideline, do not use any combination of the following commands more than 10 times per day for writing data to the non-volatile memory: FS q, GS (E (part of functions), GS (L (part of functions), GS g 0, or FS g 1.
- When a counter reaches its maximum value, its value is reset to 0 in the next updating process (maximum values for maintenance counter see page 197).The maintenance counter value can be transmitted by GS g 2.
- $n_L + n_H \times 256 = 59$ (Maximum Head Temperature): This resettable counter isn't set to 0 but is set to the actual temperature of the thermal print head.The maintenance counter value can be used for establishing the time for replacing consumed parts or cleaning.

GS g 2

Function: Transmit maintenance counter

Code ASCII: GS g 2 m n_L n_H

Code HEX: 0x1D 0x67 0x32 0x00 n_L n_H

Range: m = 0

(n_L + n_H × 256) = 20, 21, 50, 52~57, 59, 148, 149, 178, 198~200, 238~240

Description: Transmits the value of the counter specified by the number.

- n_L and n_H specify a maintenance counter number as (n_L + n_H × 256).

| Counter (n _L + n _H × 256) | Type | Description |
|--|--------------|---|
| 20 | Resettable | LF counter – 1/7.52 inch (current mechanic) |
| 21 | Resettable | Fired dots (current print head) |
| 50 | Resettable | Cutter operations (current unit) |
| 52 | Resettable | Cutter Errors |
| 53 | Resettable | Black Mark Errors |
| 54 | Resettable | Thermistor Errors |
| 55 | Resettable | Low Voltage Errors |
| 56 | Resettable | High Voltage Errors |
| 57 | Resettable | Cover Open Counter |
| 59 | Resettable | Maximum Head Temperature |
| 148 | Accumulation | LF counter – 1/7.52 inch (total) |
| 149 | Accumulation | Counts all fired dots (total) |
| 178 | Accumulation | Cutter operations (total) |
| 198 | Accumulation | Power on time in hours (total) |
| 199 | Accumulation | Power on cycles |
| 200 | Accumulation | EEPROM update cycles |
| 238 | Accumulation | Paper feeding mechanism changes |
| 239 | Accumulation | Print head changes |
| 240 | Accumulation | Cutter changes |

Notes:

- There are two kinds of maintenance counters: resettable counters and accumulation counters. A resettable counter is a maintenance counter that can be initialized by GS g 0, and an accumulation counter indicates the counter value from when the printer starts operation.
- When a counter reaches its maximum value, its value is reset to 0 in the next updating process.
- Unsupported counter numbers cannot be specified.
- The maintenance counter value consists of [Header + data + NUL], as follows:
 - Header: Hexadecimal = 0x5F/Decimal = 95: 1-byte data
 - Data: Counter value = 0x30~0x39/Decimal = 48~57: 1-byte data
 - NUL: Hexadecimal = 0x00/Decimal = 0: 1-byte data

- When the counter values are transmitted, the printer converts them to character codes corresponding to the decimal value and transmits from the most significant bit.
Example: When the counter value is 120, the transmission data for “120” is 3 bytes, consisting of 49, 50 and 48.
- The printer becomes BUSY immediately before transmitting a header and recovers to READY after transmitting a NUL (unless there are other causes of the printer being BUSY).
- The resettable maintenance counter can be initialized by GS g 0.
- The maintenance counter can be used for establishing the time for replacing consumed parts or cleaning.
- Maintenance counter data can be differentiated from other transmission data by the header of the block data. After outputting GS g 2 to the printer, if the data transmitted from the printer is [Hex=0x5F/Decimal=95], the host should process the data up to NUL [Hex=0x00/Decimal=0] as maintenance counter data. There is an exception, described below:
 - When the host is communicating with the printer by XON/XOFF control, the XOFF code might interrupt [Header ~ NUL].
- When transmitting data [Header ~ NUL] with this command, ASB status and real-time commands cannot be used.
- Be sure to use this function when the host is in the READY state.
- The counter values may be different from actual counting depending on the time difference or the error occurring.
- $(n_L + n_H \times 256) = 21, 149$: The counter value for fired dots must be multiplied by 1000.
- A detailed description how statistical information is saved can be found on page 278.
- $(n_L + n_H \times 256) = 20, 148$: Example for calculating the Linefeed Counter if a receipt is printed with 12 mm backward feed after cutting. Let's assume the high of the printed graphics is 768 dots.
- Height of the printed graphics = 768 dots
 + Distance between thermal print lines and cutter = 17 mm * 8 = 136 steps
 + Backward feed to reduce the head loss = 12 mm * 8 = 96 steps
 + compensation of the mechanical clearance = 2 * 32 = 64 steps

Steps per receipt = 1064 steps

Linefeeds per receipt = 1064 / 34 = 31,29 LF/receipt

GS h

Function: Set bar code height

Code ASCII: GS h n

Code HEX: 0x1D 0x68 n

Range: $1 \leq n \leq 255$

Default: n = 216

Description: Sets the height of a bar code.

- n specifies number of dots in the vertical direction of a bar code
- Following minimum height exists

| Barcode | Gs k System (see m in GS k) | Minimum height |
|----------------------|--------------------------------|---|
| GS1 | 11, 76 | 33 dots * X-Dimension |
| GS1 Truncated | 12, 77 | 13 dots * X-Dimension |
| GS1 Stacked | 13, 78 | 5 (Top), 7(Bottom) dots * X-Dimension |
| GS1 Stacked Omni | 14, 79 | 5 (Top), 7(Bottom) dots * X-Dimension |
| GS1 Limited | 15, 80 | 10 dots * X-Dimension |
| GS1 Expanded | 16, 81 | 34 dots * X-Dimension |
| GS1 Expanded Stacked | 16, 81 | 34 dots * X-Dimension (Row), 3 * X Dimension (Separator) |

Notes:

- This command setting is effective until performing of ESC @, reset or power-off.
- A set unit is one dot.
- One dot corresponds to 0.125 mm {1/203 inch}.
- GS h works not for composite codes and the separator for composite codes (see GS k)
- Height of composite codes are adjusted with 2 times of the selected barcode width (see GS w)
- Separators between composite and rest barcode are 1 times of the selected barcode width (see GS w)
- If the Barcode has got a minimum height, the minimum height will be used, if the n smaller than minimum.
- If the Barcode a stacked variant, n is valid for the complete barcode, with all rows.

GS k

| | | | | | | | |
|-------------------------------------|----------------|--|------|---|-----------|-----------|------------------|
| Function: | Print bar code | | | | | | |
| Code ASCII: (without 2D) | ① | GS | k | m | d1 ... dk | NUL | |
| Code HEX: (without 2D) | ① | 0x1D | 0x6B | m | d1 ... dk | NUL | |
| Code ASCII: (without 2D) | ② | GS | k | m | n | d1 ... dn | |
| Code HEX: (without 2D) | ② | 0x1D | 0x6B | m | n | d1 ... dn | |
| Code ASCII: (with 2D) | ② | GS | k | m | n | d1 ... dk | dk+2 ... dn |
| Code HEX: (with 2D) | ② | 0x1D | 0x6B | m | n | d1 ... dk | 0x7C dk+2 ... dn |
| Range: (without 2D) | ① | $0 \leq m \leq 6, 10 \leq m \leq 18$ (k and d depend on the bar code system used) | | | | | |
| Range: (with 2D) | ② | $65 \leq m \leq 73, 75 \leq m \leq 82$ (k , j and d depend on the bar code system used). | | | | | |

$$n = k + j + 1$$

Description: Selects a bar code system and prints the bar code.

• **Command is only valid at start of line!**

All characters after GS k are used as normal characters, if command not used at start of line.

- UPC-A, UPC-E, EAN-8, EAN-13, GS1 Databar support in ② mixed 1D/2D data. With 2D-data the barcodes will be encoded like the composite code specification. Without 2D Data, the barcodes will be encoded like the normal specific 1D code specification.
- | (0x7C) of barcodes which supports 1D/2D data indicates the separator between 1D and 2D data. Data before the separator are 1D, behind 2D data.
- **k** of ① indicates the number of the 1D bar code data to be printed. **k** does not need to be sent. For some barcodes **k** could be infinite, but the printer has an limitation until 255.
- **n** of ② indicates the number of the 1D + Separator + 2D bar code data.
- **d** indicates the character code of the bar code data to be printed.
- **m** specifies a bar code system as follows: ("SP" in the table indicates space.)

| m | | Barcode system | 1D/2D | Number of data | Number of characters | Characters | Remarks |
|---|---|--------------------------|-------|----------------|----------------------|------------------------------|--|
| ① | 0 | UPC-A | 1D | Fixed | $11 \leq k \leq 12$ | 0 ~ 9 $48 \leq d \leq 57$ | |
| | 1 | UPC-E | 1D | Fixed | $11 \leq k \leq 12$ | 0 ~ 9 $48 \leq d \leq 57$ | |
| | 2 | (E/J)AN13 | 1D | Fixed | $12 \leq k \leq 13$ | 0 ~ 9 $48 \leq d \leq 57$ | |
| | 3 | (E/J)AN8 | 1D | Fixed | $7 \leq k \leq 8$ | 0 ~ 9 $48 \leq d \leq 57$ | |
| | 4 | CODE39 | | Variable | $1 \leq k \leq 255$ | 0 ~ 9 $48 \leq d \leq 57$ | |
| | | | | | | A ~ Z $65 \leq d \leq 90$ | |
| | | | | | | S P 32 | |
| | | | | | | \$ 36 | |
| | | | | | | % 37 | |
| | | | | | | + 43 | |
| | | | | | | - 45 | |
| | | | | | | . 46 | |
| | | | | | | / 47 | |
| | | | | | | * 42 | start/stop character will be added automatically |
| | 5 | ITF (Interleaved 2 of 5) | | Variable | $1 \leq k \leq 255$ | 0 ~ 9 $48 \leq d \leq 57$ | |
| | 6 | CODABAR (NW7) | | Variable | $1 \leq k \leq 255$ | 0 ~ 9 $48 \leq d \leq 57$ | |
| | | | | | | A ~ D $65 \leq d \leq 68$ | (start/stop character) |
| | | | | | | \$ 36 | |
| | | | | | | + 43 | |
| | | | | | | - 45 | |
| | | | | | | . 46 | |

| | | | | | | | | |
|----|---------------|----|----------|---------------------|-----|---|----------------------|---------------------|
| | | | | | | / | 47 | |
| | | | | | | : | 58 | |
| 10 | PDF 417 | | Variable | $1 \leq k \leq 255$ | | | $32 \leq d \leq 255$ | |
| 11 | GS1 | 1D | Variable | $1 \leq k \leq 13$ | 0~9 | | | $48 \leq d \leq 57$ |
| 12 | GS1 Truncated | 1D | Variable | $1 \leq k \leq 13$ | 0~9 | | | $48 \leq d \leq 57$ |

| | | | | | | | | |
|----|------------------------------|----|----------|--------------------|-----|--|----------------------|---------------------|
| 13 | GS1 Stacked | 1D | Variable | $1 \leq k \leq 13$ | 0~9 | | | $48 \leq d \leq 57$ |
| 14 | GS1 Stacked Omni-Directional | 1D | Variable | $1 \leq k \leq 13$ | 0~9 | | | $48 \leq d \leq 57$ |
| 15 | GS1 Limited | 1D | Variable | $1 \leq k \leq 13$ | 0~9 | | | $48 \leq d \leq 57$ |
| 16 | GS1 Expanded | 1D | Variable | $1 \leq k \leq 72$ | 0~9 | | $48 \leq d \leq 57$ | |
| | | | | | A~Z | | $65 \leq d \leq 90$ | |
| | | | | | a~z | | $97 \leq d \leq 122$ | |
| | | | | | SP | | 32 | |
| | | | | | ! | | 33 | |
| | | | | | " | | 34 | |
| | | | | | # | | 35 (FNC1) | |
| | | | | | % | | 37 | |
| | | | | | & | | 38 | |
| | | | | | ' | | 39 | |
| | | | | | (| | 40 | |
| | | | | |) | | 41 | |
| | | | | | * | | 42 | |
| | | | | | + | | 43 | |
| | | | | | , | | 44 | |
| | | | | | - | | 45 | |
| | | | | | . | | 46 | |
| | | | | | / | | 47 | |
| | | | | | : | | 58 | |
| | | | | | ; | | 59 | |
| | | | | | < | | 60 | |
| | | | | | = | | 61 | |
| | | | | | > | | 62 | |
| | | | | | ? | | 63 | |
| | | | | | _ | | 95 | |

| | | | | | | | | |
|---|----|--------------------------|----|----------|---------------------|---------------------|---------------------|------------------------|
| ② | 65 | UPC-A | 1D | Fixed | $11 \leq k \leq 12$ | $0 \sim 9$ | $48 \leq d \leq 57$ | |
| | | | 2D | Variable | $1 \leq j \leq n$ | $0 \leq d \leq 255$ | | CC-A, CC-B (4 Columns) |
| | 66 | UPC-E | 1D | Fixed | $11 \leq k \leq 12$ | $0 \sim 9$ | $48 \leq d \leq 57$ | |
| | | | 2D | Variable | $1 \leq j \leq n$ | $0 \leq d \leq 255$ | | CC-A, CC-B (2 Columns) |
| | 67 | (E/J)AN13 | 1D | Fixed | $12 \leq k \leq 13$ | $0 \sim 9$ | $48 \leq d \leq 57$ | |
| | | | 2D | Variable | $1 \leq j \leq n$ | $0 \leq d \leq 255$ | | CC-A, CC-B (4 Columns) |
| | 68 | JAN8 (EAN8) | 1D | Fixed | $7 \leq k \leq 8$ | $0 \sim 9$ | $48 \leq d \leq 57$ | |
| | | | 2D | Variable | $1 \leq j \leq n$ | $0 \leq d \leq 255$ | | CC-A, CC-B (3 Columns) |
| | 69 | CODE39 | | Variable | $1 \leq n \leq 255$ | $0 \sim 9$ | $48 \leq d \leq 57$ | |
| | | | | | | A~Z | $65 \leq d \leq 90$ | |
| | | | | | | SP | 32 | |
| | | | | | | \$ | 36 | |
| | | | | | | % | 37 | |
| | | | | | | + | 43 | |
| | | | | | | - | 45 | |
| | | | | | | . | 46 | |
| | | | | | | / | 47 | |
| | | | | | | * | 42 | (start/stop character) |
| | 70 | ITF (Interleaved 2 of 5) | | Variable | $1 \leq n \leq 255$ | $0 \sim 9$ | $48 \leq d \leq 57$ | |
| | 71 | CODABAR (NW7) | | Variable | $1 \leq n \leq 255$ | $0 \sim 9$ | $48 \leq d \leq 57$ | |
| | | | | | | A~D | $65 \leq d \leq 68$ | |
| | | | | | | \$ | 36 | |
| | | | | | | + | 43 | |
| | | | | | | - | 45 | |
| | | | | | | . | 46 | |
| | | | | | | / | 47 | |
| | | | | | | : | 58 | |

| | | | | | | | | |
|--|--|--|--|--|--|-----|------------------------------|--|
| | | | | | | 0~9 | $48 \leq \mathbf{d} \leq 57$ | |
| | | | | | | A~Z | $65 \leq \mathbf{d} \leq 90$ | |
| | | | | | | SP | 32 | |
| | | | | | | \$ | 36 | |
| | | | | | | % | 37 | |
| | | | | | | + | 43 | |
| | | | | | | - | 45 | |
| | | | | | | . | 46 | |
| | | | | | | / | 47 | |


| | | | | | | | | |
|--|----|------------------------------|----|----------|-------------------------------------|------------------------------|-------------------------------|------------------------|
| | 73 | CODE128 | | Variable | $1 \leq \mathbf{n} \leq 255$ | $0 \leq \mathbf{d} \leq 105$ | | |
| | 75 | PDF 417 | | Variable | $1 \leq \mathbf{n} \leq 255$ | $0 \leq \mathbf{d} \leq 255$ | | |
| | 76 | GS1 | 1D | Variable | $1 \leq \mathbf{k} \leq 13$ | 0~9 | $48 \leq \mathbf{d} \leq 57$ | |
| | | | 2D | Variable | $1 \leq \mathbf{j} \leq \mathbf{n}$ | $0 \leq \mathbf{d} \leq 255$ | | CC-A, CC-B (4 Columns) |
| | 77 | GS1 Truncated | 1D | Variable | $1 \leq \mathbf{k} \leq 13$ | 0~9 | $48 \leq \mathbf{d} \leq 57$ | |
| | | | 2D | Variable | $1 \leq \mathbf{j} \leq \mathbf{n}$ | $0 \leq \mathbf{d} \leq 255$ | | CC-A, CC-B (4 Columns) |
| | 78 | GS1 Stacked | 1D | Variable | $1 \leq \mathbf{k} \leq 13$ | 0~9 | $48 \leq \mathbf{d} \leq 57$ | |
| | | | 2D | Variable | $1 \leq \mathbf{j} \leq \mathbf{n}$ | $0 \leq \mathbf{d} \leq 255$ | | CC-A, CC-B (4 Columns) |
| | 79 | GS1 Stacked Omni-Directional | 1D | Variable | $1 \leq \mathbf{k} \leq 13$ | 0~9 | $48 \leq \mathbf{d} \leq 57$ | |
| | | | 2D | Variable | $1 \leq \mathbf{j} \leq \mathbf{n}$ | $0 \leq \mathbf{d} \leq 255$ | | CC-A, CC-B (4 Columns) |
| | 80 | GS1 Limited | 1D | Variable | $1 \leq \mathbf{k} \leq 13$ | 0~9 | $48 \leq \mathbf{d} \leq 57$ | |
| | | | 2D | Variable | $1 \leq \mathbf{j} \leq \mathbf{n}$ | $0 \leq \mathbf{d} \leq 255$ | | CC-A, CC-B (3 Columns) |
| | 81 | GS1 Expanded | 1D | Variable | $1 \leq \mathbf{k} \leq 72$ | 0~9 | $48 \leq \mathbf{d} \leq 57$ | |
| | | | | | | A~Z | $65 \leq \mathbf{d} \leq 90$ | |
| | | | | | | a~z | $97 \leq \mathbf{d} \leq 122$ | |
| | | | | | | SP | 32 | |
| | | | | | | ! | 33 | |

| | | | | | | | | |
|--|----|-------------------------|----|----------|--------------------|---------------------|--------------|--------------------------|
| | | | | | | " | 34 | |
| | | | | | | # | 35 (FNC1) | |
| | | | | | | % | 37 | |
| | | | | | | & | 38 | |
| | | | | | | ' | 39 | |
| | | | | | | (| 40 | |
| | | | | | |) | 41 | |
| | | | | | | * | 42 | |
| | | | | | | + | 43 | |
| | | | | | | , | 44 | |
| | | | | | | - | 45 | |
| | | | | | | . | 46 | |
| | | | | | | / | 47 | |
| | | | | | | : | 58 | |
| | | | | | | ; | 59 | |
| | | | | | | < | 60 | |
| | | | | | | = | 61 | |
| | | | | | | > | 62 | |
| | | | | | | ? | 63 | |
| | | | | | | _ | 95 | |
| | | | 2D | Variable | $1 \leq j \leq n$ | $0 \leq d \leq 255$ | | CC-A, CC-B (4 Columns) |
| | 82 | UCC EAN128 CC-A/B | 1D | Variable | $1 \leq k \leq 48$ | $0 \leq d \leq 105$ | | |
| | | | 2D | Variable | $1 \leq j \leq n$ | $0 \leq d \leq 255$ | | CC-A, CC-B (2 Columns) |
| | 83 | UCC EAN128 CC-C | 1D | Variable | $1 \leq k \leq 48$ | $0 \leq d \leq 105$ | | |
| | | | 2D | Variable | $1 \leq j \leq n$ | $0 \leq d \leq 255$ | | CC-C (k < 57, 4 Columns) |

Notes for ① and ②:

- If not start of line, this command will be ignored.
- When standard mode is selected, this command is enabled only when the printing position is at the head of a line or when no data exists in the print buffer.
- When page mode is selected, this command develops the bar code data in the print buffer but the printer does not print the bar code data.
- The bar code width that exceeds the printing area cannot be specified.
- This command feeds as much paper as required to print the bar code, regardless of the line spacing specified by line space setting commands.
- The bar code is not affected by print mode (emphasized, underline, 90° clockwise-rotated or upside-down printing mode).
- After bar code printing, the printing position moves to the left end of the printing area. The printer enters the status of the printing position at the head of a line or no data exists in the print buffer.
- The values of m from 0 to 6 in ① and from 65 to 71 in ② select the same bar code system, respectively. The printing results are the same.
- This command specifies m = 0 to 6 and ends with a NUL code.

- When an odd number of data is processed for ITF bar code system (m = 5), the printer ignores the last received data.
 - The printer processes n bytes from the next data as bar code data by this command specifying m = 65 to 71.
 - Printing area does not include quiet zone (left/right margin) of bar code. Make sure to secure the quiet zone, using this command.
 - When printing ladder bar code (bar code rotated by 90 degrees in page mode) the printer starts actual printing after it reaches control speed for printing ladder bar code. It is needed to feed paper amount of 10 dots or less in this operation. Therefore, if there is no area more than 10 dots at the top of the page, no-print area will be generated.
 - If the printable area is too small for barcode, barcode will not be printed!
 - If the separator for composite code is given without composite code, barcode will not be printed!
- UPC-A
(m = 0, 65)
process:**
- Modular check character is processed as following.
 - Automatically added when processing data is 11 byte.
 - The 12th byte data is processed as a modular check character when processing data is 12 byte. In this case, modular check character is not checked.
 - Left guard bar/center bar/right guard bar are added automatically.
- UPC-A-
Composite
(m = 65)
process:**
- Barcode is combination of UPC-A and the composite codes CC-A and CC-B
 - Separator to composite code is '|' (ASCII), 7C (HEX), 124 (DEZ)
 - Barcode can be printed without composite part
 - Barcode will not be printed if the separator is given without composite code
- UPC-E
(m = 1, 66)
process:**
- The first data (d1) is processed as number system character (NSC) so 0 must be specified.
 - If n is out of the specified range or if n is an odd number when ITF bar code system (m = 70) is selected, this command is canceled and the following data is processed as normal data.
 - Modular check character is processed as following.
 - Automatically added when processing data is 11 byte.
 - The 12th byte data is processed as a modular check character when processing data is 12 byte. In this case, modular check character is not checked.
 - Simplified code with 6 digits is printed. Left guard bar/right guard bar are added automatically.
- JAN13/EAN
13 (m = 2,
67) process:**
- Modular check character is processed as follows:
 - Automatically added when processing data is 13 byte.
 - The 13th byte data is processed as a modular check character when processing data is 13 byte. In this case, modular check character is not checked.
 - Left guard bar/center bar/right guard bar are added automatically.
- JAN8/EAN8
(m = 3, 68)
process:**
- Modular check character is processed as follows:
 - Automatically added when processing data is 7 byte.
 - The 8th byte data is processed as a modular check character when processing data is 8 byte. In this case, modular check character is not

| | |
|--|---|
| | checked. |
| | <ul style="list-style-type: none"> Left guard bar/center bar/right guard bar are added automatically. |
| CODE39 (m = 4, 69) process: | <ul style="list-style-type: none"> The printer processes the start code (ASCII = */Hex = 2Ah/Decimal = 42) as follows: <ul style="list-style-type: none"> When the first bar code (d1) is “*”, the printer processes the data as a first character. If the first bar code (d1) is not “*”, the printer adds a start character (*) automatically. The printer processes the start code (ASCII = */Hex = 2Ah/Decimal = 42) as follows: <ul style="list-style-type: none"> When the last bar code (dk or dn) is “*”, the printer processes the data as a last character. If the last bar code (dk or dn) is not “*”, the printer adds a last character (*) automatically. When “*” is processed during bar code data processing, the printer processes “*” as a stop character. The printer prints data preceding “*” and finishes command processing. Therefore, data following “*” are processed as normal data. Check digits are not calculated and added. |
| ITF (Interleaved 2 of 5) (m = 5, 70) process: | <ul style="list-style-type: none"> Start code and stop code are added automatically. Check digits are not calculated and added. Note: ITF request a even count of digits. In case of odd digits, a leading 0 will be inserted if the memory switch “CodeITF Leading 0” is enabled (see GS (E). In other case last digit will be discarded. |
| CODABAR (m = 6, 71) process: | <ul style="list-style-type: none"> Start code and stop code are not added automatically. Transmit data including the codes. Check digits are not calculated and added. |
| PDF417 (m = 10, 75) process: | <ul style="list-style-type: none"> Parameter is set with command GS p Printing this barcode synchronize the printer. Therefore, the print would be stopped for a short time. |
| CODE93 (m = 72) | <ul style="list-style-type: none"> Start code and stop code are added automatically. Check digits (2 character) are calculated and added automatically. |
| process: | <ul style="list-style-type: none"> Special character HRI is processed as follows: <ul style="list-style-type: none"> The printer prints an HRI character “ ” as start and stop character. The printer prints HRI characters “ + an alphabetic character” as a control character (unprinted character). |
| CODE128 (m = 73) process: | <ul style="list-style-type: none"> Make sure to specify the start character. The start character must be a code set selection character (any of CODE A, CODE B, or CODE C) which selects the first code set (see table below). If no start code is given, the CODE_C is default. Table below list the allowed values and code 128 – code table conversion. Specific characters are in <i>bold-italic</i>: |

| Value (dezimal) | Value (hex) | Code A | Code B | Code C |
|------------------------|----------------|--------|--------|--------|
| 0 | 00 | Space | Space | "00" |
| 1 | 01 | ! | ! | "01" |
| 2 | 02 | " | " | "02" |
| 3 | 03 | # | # | "03" |
| 4 | 04 | \$ | \$ | "04" |
| 5 | 05 | % | % | "05" |
| 6 | 06 | & | & | "06" |
| 7 | 07 | ' | ' | "07" |
| 8 | 08 | (| (| "08" |
| 9 | 09 |) |) | "09" |
| 10 | 0A | * | * | "10" |
| 11 | 0B | + | + | "11" |
| 12 | 0C | , | , | "12" |
| 13 | 0D | - | - | "13" |
| 14 | 0E | . | . | "14" |
| 15 | 0F | / | / | "15" |
| 16 | 10 | 0 | 0 | "16" |
| 17 | 11 | 1 | 1 | "17" |
| 18 | 12 | 2 | 2 | "18" |
| 19 | 13 | 3 | 3 | "19" |
| 20 | 14 | 4 | 4 | "20" |
| 21 | 15 | 5 | 5 | "21" |
| 22 | 16 | 6 | 6 | "22" |
| 23 | 17 | 7 | 7 | "23" |
| 24 | 18 | 8 | 8 | "24" |
| 25 | 19 | 9 | 9 | "25" |
| 26 | 1A | : | : | "26" |
| 27 | 1B | ; | ; | "27" |
| 28 | 1C | < | < | "28" |
| 29 | 1D | = | = | "29" |
| 30 | 1E | > | > | "30" |
| 31 | 1F | ? | ? | "31" |
| 32 | 20 | @ | @ | "32" |
| 33 | 21 | A | A | "33" |
| 34 | 22 | B | B | "34" |
| 35 | 23 | C | C | "35" |
| 36 | 24 | D | D | "36" |
| 37 | 25 | E | E | "37" |
| 38 | 26 | F | F | "38" |
| 39 | 27 | G | G | "39" |
| 40 | 28 | H | H | "40" |

| | | | | |
|----|----|-----|---|------|
| 41 | 29 | I | I | "41" |
| 42 | 2A | J | J | "42" |
| 43 | 2B | K | K | "43" |
| 44 | 2C | L | L | "44" |
| 45 | 2D | M | M | "45" |
| 46 | 2E | N | N | "46" |
| 47 | 2F | O | O | "47" |
| 48 | 30 | P | P | "48" |
| 49 | 31 | Q | Q | "49" |
| 50 | 32 | R | R | "50" |
| 51 | 33 | S | S | "51" |
| 52 | 34 | T | T | "52" |
| 53 | 35 | U | U | "53" |
| 54 | 36 | V | V | "54" |
| 55 | 37 | W | W | "55" |
| 56 | 38 | X | X | "56" |
| 57 | 39 | Y | Y | "57" |
| 58 | 3A | Z | Z | "58" |
| 59 | 3B | [| [| "59" |
| 60 | 3C | \ | \ | "60" |
| 61 | 3D |] |] | "61" |
| 62 | 3E | ^ | ^ | "62" |
| 63 | 3F | _ | _ | "63" |
| 64 | 40 | NUL | ` | "64" |
| 65 | 41 | SOH | a | "65" |
| 66 | 42 | STX | b | "66" |
| 67 | 43 | ETX | c | "67" |
| 68 | 44 | EOT | d | "68" |
| 69 | 45 | ENQ | e | "69" |
| 70 | 46 | ACK | f | "70" |
| 71 | 47 | BEL | g | "71" |
| 72 | 48 | BS | h | "72" |
| 73 | 49 | HT | i | "73" |
| 74 | 4A | LF | j | "74" |
| 75 | 4B | VT | k | "75" |
| 76 | 4C | FF | l | "76" |
| 77 | 4D | CR | m | "77" |
| 78 | 4E | SO | n | "78" |
| 79 | 4F | SI | o | "79" |
| 80 | 50 | DLE | p | "80" |
| 81 | 51 | DC1 | q | "81" |
| 82 | 52 | DC2 | r | "82" |
| 83 | 53 | DC3 | s | "83" |
| 84 | 54 | DC4 | t | "84" |
| 85 | 55 | NAK | u | "85" |

| | | | | |
|-----|----|----------------|---------------|---------------|
| 86 | 56 | SYN | v | "86" |
| 87 | 57 | ETB | w | "87" |
| 88 | 58 | CAN | x | "88" |
| 89 | 59 | EM | y | "89" |
| 90 | 5A | SUB | z | "90" |
| 91 | 5B | ESC | { | "91" |
| 92 | 5C | FS | | "92" |
| 93 | 5D | GS | } | "93" |
| 94 | 5E | RS | ~ | "94" |
| 95 | 5F | US | DEL | "95" |
| 96 | 60 | FNC 3 | FNC 3 | "96" |
| 97 | 61 | FNC 2 | FNC 2 | "97" |
| 98 | 62 | SHIFT | SHIFT | "98" |
| 99 | 63 | CODE C | CODE C | "99" |
| 100 | 64 | CODE B | FNC 4 | CODE B |
| 101 | 65 | FNC 4 | CODE A | CODE A |
| 102 | 66 | FNC 1 | FNC 1 | FNC 1 |
| 103 | 67 | START_A | | |
| 104 | 68 | START_B | | |
| 105 | 69 | START_C | | |

- CODE C values are coded BCD like. Range goes from 00 – 99 and encode two digits, e.g. 0 – '0' and '0', 21 – '2' and '1' ... (See table above).
- Stop character is added automatically.
- Check digit is calculated and added automatically.
- Special character HRI is processed as follows:
 - The printer does not print HRI characters that correspond to the shift character or code set selection character (CODE A, CODE B, or CODE C).
 - HRI characters of the function characters (FNC1, FNC2, FNC3, or FNC4) and control characters (0x00 to 0x1F and 0x7F) are printed as spaces.
- Not printable characters (< 32) are printed as ' '.
- The following example should be helpful generating code 128:

| Values | Code128 Conversion |
|----------------------------------|---|
| 105 66 0 20 0 1 0 4 55 | START_C 66 00 20 00 01 00 04 55 |
| 104 34 99 40 3 79 61 13 8 100 16 | START_B B CODE C 40 03 79 61 08 CODE B 0 |
| 103 65 98 65 65 99 20 0 1 0 4 55 | START_A . SHIFT a . CODE C 20 00 01 00 04 55 |

**Composite
(m=11, 76)
process:**

- Separator to composite code is '|' (ASCII), 7C (HEX), 124 (DEZ)
- Barcode can be print without composite part
- Barcode will not be printed if the separator is given without composite code
- If encoding of composite code failed, barcode will not be printed
- Example (2001234567890|Composite):



**GS1-
Truncated–
Composite
(m=12, 77)
process:**

- Barcode is a combination of GS1 Truncated and the composite codes CC-A and CC-B
- Separator to composite code is '|' (ASCII), 7C (HEX), 124 (DEZ)
- Barcode can be printed without the composite part
- Barcode will not be printed if the separator is given without composite code
- If encoding of composite code failed, barcode will not be printed
- Example (2001234567890|Composite):



**GS1-
Stacked–
Composite
(m=13, 78)
process:**

- Barcode is combination of GS1 Stacked and the composite codes CC-A and CC-B
- Separator to composite code is '|' (ASCII), 7C (HEX), 124 (DEZ)
- Barcode can be printed without the composite part
- Barcode will not be printed if the separator is given without composite code
- If encoding of composite code failed, barcode will not be printed
- Example (2001234567890|Composite):



**GS1-
Stacked-
Omni-
Composite
(m=14, 79)
process:**

- Barcode is combination of GS1 Stacked Omni and the composite codes CC-A and CC-B
- Separator to composite code is '|' (ASCII), 7C (HEX), 124 (DEZ)
- Barcode can be printed without the composite part
- Barcode will not be printed if the separator is given without composite code
- If encoding of composite code failed, barcode will not be print
- Example (2001234567890|Composite):



**GS1-
Limited-
Composite
(m=15, 80)
process:**

- Barcode is combination of GS1 Limited and the composite codes CC-A and CC-B
- Separator to composite code is '|' (ASCII), 7C (HEX), 124 (DEZ)
- Barcode can be printed without the composite part
- Barcode will not be printed if the separator is given without composite code
- Numeric limit is 1999999999999. All barcodes greater this value will not be printed. The barcode information is not printed as normal text.
- If encoding of composite code failed, barcode will not be printed
- Example (0040941991026|Composite):



**GS1-
Expand-
Composite
(m=16, 81)
process:**

- Barcode can be print out over more than 1 row by setting the segments per row (see ESC w n b Barcode is combination of GS1 Expand and the composite codes CC-A and CC-B
- Separator to composite code is '|' (ASCII), 7C (HEX), 124 (DEZ)
- Barcode can be printed without the composite part
- Barcode will not be printed if the separator is given without composite code
- If encoding of composite code failed, barcode will not be printed
- Example (2001234567890|Composite):



- Caution: Barcode has a determine structure. This encoding function works for all combinations but it is not sure that the decoder (scanner) interprets the barcode like the data which was encoded.
- '#' is FNC1 control char. Please refer to ESC w n b.

- UCC EAN128 (m=82,m=83) process:**
- Barcode is combination of code 128 and the composite codes CC-A, CC-B (m=82) and CC-C (m=83)
 - Barcode can be printed without the composite part
 - Barcode will not be printed if the separator is given without composite code
 - UCC EAN is an Code 128 with follow structure:

| Start Character | Function Code 1 | Element String | | Checksum | Stop Character |
|-----------------------------|-----------------|------------------------|---------------|----------|----------------|
| | | Application Identifier | Data Filed(s) | | |
| (START_A, START_B, START_C) | (FNC_1) | (AI) | | | |

- START_C** is default
- FNC_1** have to be set by user
- AI and Data Field(s) is set by user and not is not checked of validation according to GS1-128 specification (<http://www.gs1-128.info/>)
- Separator to composite code is '|' (ASCII), 7C (HEX), 124 (DEZ)
- If encoding of composite code failed, barcode will not be printed
- Composite Code is only usable with an composite Barcode
- The maximum of encoded data depends from the parts of characters and digits

CC_A

| Columns | Max Digits | Max Chars |
|---------|------------|-----------|
| 2 | 47 | 26 |
| 3 | 47 | 26 |
| 4 | 56 | 31 |

CC_B

- Input-Buffer (255 chars) limits the maximum
- If the maximum reached CC_B is chosen
- Composite Code is only usable with an composite Barcode
- The maximum of encoded data depends from the parts of characters and digits

| Columns | Max Digits | Max Chars |
|---------|------------|-----------|
| 2 | 95 | 55 |
| 3 | 219 | 127 |
| 4 | 338 | 196 |

8 CC_C

- Input-Buffer (255 chars) limits the maximum
- Composite Code is only usable with an composite Barcode (UCC EAN 128 CC_C)

GS p**Function:** Select PDF 417 parameters**Code ASCII:** GS p a b c d e f**Code HEX:** 0x1D 0x70 a b c d e f

Default:

a = 1
b = 2
c = 58
d = 7
e = 3
f = 10

Description: Selects the two-dimensional PDF 417 parameters as follows:

| Value | | Range | Description | SUPPORT |
|-------|-------------|---------------------|--|--------------|
| a, b | | | The ration of bar height to symbol length. | NO !! |
| | a = height | $1 \leq a \leq 10$ | | NO !! |
| | b = width | $1 \leq b \leq 100$ | | NO !! |
| c | rows | $3 \leq c \leq 90$ | Number of rows in the matrix of code words. | NO !! |
| d | columns | $7 \leq d \leq 30$ | Number of columns in the matrix of code words. | NO !! |
| e | x dimension | $1 \leq e \leq 7$ | Width of a single module in dots. | YES |
| f | y dimension | $2 \leq f \leq 25$ | Height of the code word in dots. | NO !! |

PDF 417 is a multi-row, continuous, variable length symbolism which has high data capacity. Each symbol has between 3 and 90 rows, with each row containing a start pattern, a left row indicator, 1 to 30 data characters, a right row indicator and a stop pattern. The number and length of the rows are selectable, which allows the aspect ratio to be adjusted to particular labeling applications. There are no separator bars between rows.

Each character has four bars and four spaces within 17 modules, and is assigned a value between 0 and 928. For this symbolism, it is common to refer to these character values as “code words”.

There are three mutually exclusive sets of symbol patterns, or clusters, each having 929 distinct patterns. Because different clusters are used for adjacent rows, it is possible for the decoder to tell if the scanning path is crossing row boundaries without the use of separator bars.

All parameter except **e** ignored, but it have to be transmitted. The height is the double of the width.

GS r**Function:** Transmit status**Code ASCII:** GS r n**Code HEX:** 0x1D 0x72 n**Range:** n = 1, 2, 4, 49, 50, 52**Description:** Transmits 1 byte of status data using n as follows:

| n | Function |
|-------|--|
| 1, 49 | Transmits paper sensor status |
| 2, 50 | Transmits drawer kick-out connector status |
| 4, 52 | Transmits Flash Memory User Sector status |

Notes:

- Each status is 1 byte.
- The status to be transmitted is as follows:
 - Paper sensor status (n = 1, 49)

| Bit | Function | Status | |
|-----|----------------------------|---------------|----------|
| | | 0 | 1 |
| 0 | Paper roll near-end sensor | Paper present | No paper |
| 1 | Cover | Closed | Open |
| 2 | Paper roll end sensor | Paper present | No paper |
| 3 | Undefined | | |
| 4 | Not used | Fixed to 0 | |
| 5 | Undefined | | |
| 6 | Undefined | | |
| 7 | Not used | Fixed to 0 | |

- The status to be transmitted is as follows:
 - Drawer kick-out connector status (n = 2, 50)

| Bit | Function | Status | |
|-----|---------------------------------|------------|------|
| | | 0 | 1 |
| 0 | Drawer kick-out connector pin 3 | Low | High |
| 1 | Drawer kick-out connector pin 3 | Low | High |
| 2 | Undefined | | |
| 3 | Undefined | | |
| 4 | Not used | Fixed to 0 | |
| 5 | Undefined | | |
| 6 | Undefined | | |
| 7 | Not used | Fixed to 0 | |

- The status to be transmitted is as follows:
 - Flash Memory User Sector status (**n** = 4, 52)

| Bit | Function | Status | |
|-----|-------------------------|----------------------------------|---|
| | | 0 | 1 |
| 0 | Undefined | | |
| 1 | Undefined | | |
| 2 | User data storage | Write successful | Write failed, specified area not erased |
| 3 | Flash Logo | Area adequate, definition stored | Area not adequate |
| 4 | Not used | Fixed to 0 | |
| 5 | User-defined characters | Not written to Flash | Written to Flash |
| 6 | Undefined | | |
| 7 | Not used | Fixed to 0 | |

- After the print changing line operation ends, paper sensor status (**n** = 1, 49) is transmitted. Therefore if use GS r 1 according to the printing instruction, host recognizes the print completion by receiving paper sensor status.
- Normal status can be differentiated by the information of bits 4, and 7 from other transmission data. If the data transmitted from the printer after outputting GS r to the printer is "0xx1xx10"(x = 0 or 1), process the data as a normal status.
- When the paper roll cover is open, paper detection (detected by the paper roll end sensor) may be incorrect.
- When **n** is out of the specified range, the command is ignored.
- When DTR/DSR RS232C communications handshaking control is selected, the printer transmits the one-byte response only when the host signal DSR indicates it is ready to receive data.
- When XON/XOFF RS232C communications handshaking control is selected, the printer transmits the one-byte response regardless of the host signal DSR.

GS w

Function: Set bar code width

Code ASCII: GS w n

Code HEX: 0x1D 0x77 n

Range: $2 \leq n \leq 6$

Default: n = 3

Description: Sets the horizontal size of a bar code.

- n specifies the bar code module width.

Notes:

- Bar code types are Multi level barcode (UPC-A, UPC-E, JAN13(EAN13), JAN8(EAN8), CODE93, and CODE128) and Binary level barcode (CODE39, ITF, CODABAR(NW7)). The units for n depend on the printer model.
- This command setting is effective until performing of ESC @, reset or power-off.
- If the barcode is too wide for printable area, barcode will not be printed.
- The module width differs depending on the specification. (Unit: mm)

| n | Module width (mm) for multilevel bar code |
|---|---|
| 1 | 0.125 {0.005 inch} |
| 2 | 0.250 {0.010 inch} |
| 3 | 0.375 {0.015 inch} |
| 4 | 0.500 {0.020 inch} |
| 5 | 0.625 {0.025 inch} |
| 6 | 0.750 {0.030 inch} |

GS 0x81

Function: Set paper type
Code ASCII: GS 0x81 **m** **n**
Code HEX: 0x1D 0x81 **m** **n**
Range: $0 \leq m \leq 255$
 $0 \leq n \leq 255$
Default: **m** = 0 (monochrome paper)
Description: Sets the paper type specified by **m**, as follows:

| m | Mode |
|----------|--------------------------|
| 0 | monochrome (black) paper |
| 1 | two-color papers |

This command will set the optimum parameter values in the thermal print engine control hardware for defined monochrome or two-color paper chemistry. The **m n** parameters select paper category and formulation version respectively.

(**m n** = 0 0) defines the default monochrome (black category, initial version) paper, out-of-box printers will also have factory preset descriptions for customer selected color types: (**m n** = 1 0) red/black paper.

When issuing this command a value of **n** = 0xFF can always be use: that is interpreted as requested the setting of the highest version defined in the printer of that category. This is a save way for an application to always select the latest of a manufacturer's paper category, thus choosing "latest standard red/black".

An incorrect setting of **m n** for a two-color paper or non-standard monochrome paper, or failure to set **m n** when a color paper is inserted will result in poor print quality.

The last set paper type choice is stored in non-volatile memory and is retained after a power loss and across reset commands. The initial value at first boot after firmware load (or reload) is **m n** = 0 0.

Notes:

- For better printing results of the two-color paper use emphasized printing mode.

GS 0x82

- Function:** Print raster monochrome graphics
- Code ASCII:** GS 0x82 **n1 ... n72** (576 dots, 80 mm paper), **or n51** (408 dots, 57.5 mm paper)
- Code HEX:** 0x1D 0x82 **n1 ... n72** (576 dots, 80 mm paper), **or n51** (408 dots, 57.5 mm paper)
- Range:** **n1** to **n72/n51** corresponds to one dot row data for a thermal receipt printer
- Description:** Each bit defines whether or not a dot of the current color will be printed. This command is used for printing a monochrome graphics in real-time. Offsets, page and any other modes or overlays, including watermark do not apply and are overwritten by this command. A complete rendering of the intended final image should have been done by the application before sending the dot rows.
If two-color paper is indicated by the set paper type command, then the raster will be printed in the color that is defined by the set current color command.
- Notes:**
- This command is identical to command DC1(see page 31).

GS 0x83

- Function:** Print raster color graphics
- Code ASCII:** GS 0x83 **n1 ... n144** (576 dots, 80 mm paper), **or n102** (408 dots, 57.5 mm paper)
- Code HEX:** 0x1D 0x83 **n1 ... n144** (576 dots, 80 mm paper), **or n102** (408 dots, 57.5 mm paper)
- Range:** **n1** to **n144/n102** corresponds to one dot row data
- Description:** For each printed dot row starting at the top left, two-part bit strings are used to define (in the first half), all dots that are of either color (i.e. not white). The second half string defines only the dots where the color is black. Thus all dots which are on in the first half string but not on in the second half string, select the secondary color. The parameter of this command is thus a string of bytes for one dot row with the same structure as defined for the thermal color format file given in the download color logo command. This command is used for printing a single raster of color graphics in real-time. Offsets, page and any other modes or overlays, including watermark, and current color do not apply to this command. A complete rendering of the intended final image has to be done by the application before sending the dot rows.

GS 0x84

Function: Download logo image

Code ASCII: GS 0x84 m n1 n2 d1 ... dx

Code HEX: 0x1D 0x84 m n1 n2 d1 ... dx

Range: $x = (n1 * n2 * 8) * m$

m = 1 = monochrome

m = 2 = two-color

n1 ≤ 640/8

n2 ≤ 512/8

Description: The latest value from the set current logo command will be the logo index to be used to store the download graphics.

m identifies whether the image is monochrome (which requires one parameter bit row description) or two-color, which requires a pairing of bit descriptions for each row.

n1 * n2 define the rectangular image **n1** byte wide and **n2** bytes long, **n1 * 8** specifies the number of dot columns, and **n2 * 8** the number of dot rows. That is, each row is defined by an integral number of bytes and the number of rows is also an integral number of bytes. Note that **n2** can be any length, subject of memory space availability.

If 57.5 mm paper is used, the value of **n1** could be bigger than 408/8 bytes but of course, the logo is truncated on the right side while printed.

For each color dot row starting at the top left, a two part parameter byte string is used to define first, all dots that are not white, and the second half defines all dots where the color is black. Thus all dots that are on (=1) in the first half but not on in the second half select the paper color. A sequence of these raster row strings is used to specify the complete logo.

In the monochrome case, only one bit is needed per row. This is the same structure as used for the definitions of print raster monochrome graphics and print raster color graphics.

This command is used for storing a logo of **n1** by **n2** size indexed by the current logo value.

After downloading a logo to the printer, wait 100 ms to allow the printer time to write the logo to flash.

Notes:

- The minimum of rows are 8 !! **n2** described the count of dot rows in byte, like **n1**. That means the dot height of logo must be a multiple of 8!.

MSB LSB MSB LSB MSB LSB MSB LSB

| | | | |
|--------------------------|--------------------------|--------------------------|---------------------------|
| d₁ | d₂ | ... | d_{n1} |
| d_{n1+1} | d_{n1+2} | ... | d_(2xn1) |
| . | . | . | . |
| . | . | . | . |
| d_{n2xn1} | d_{n2xn1} | d_{n2xn1} | d_{n2xn1} |

GS 0x8D

Function: Text strike-through mode

Code ASCII: GS 0x8D **n m**

Code HEX: 0x1D 0x8D **n m**

Range: **m** = 0 = retain same color as the character itself
m = 1 = black
m = 2 = paper color
n = standard cell height

Default: **n** = 0 (off)

Description: This command prints a strike-through over characters. If the strike-through is as wide as the cell height, this will produce a cell that will be printed as a solid current color.

When characters are greater than normal size, such as double-high, the number of character rows claimed by **n** also increases proportionally, such as doubling for double-high cells. Location of the strike-through on a cell is on a cell-by-cell basis, so mixing cell sizes on the same print row will give uneven results.

GS 0x8E

Function: Download paper type description

Code ASCII: GS 0x8E n_L n_H d1 ... dn

Code HEX: 0x1D 0x8E n_L n_H d1 ... dn

Description: This command will store in flash memory a paper type description identified by the structure in d1..dn, adding the uniquely (by type category and version) identified structure for subsequent use by the set paper type command. n_L+n_H *256 define the number of bytes x that follow. These bytes contain the proprietary structure and CRC to operate the thermal print head. This structure contains the hardware parameter values needed to print on formulations of monochrome and two-color thermal papers. New paper definitions should be obtained from trusted sources such as the TPG, Inc. Web site in order to optimize print quality while preventing premature head burnout or other damaging effects.

New definitions do not change any which had already been set. If an immediate effect is desired, follow up this command with a set paper type m n (where m and n are bytes 0 and 1 of the description). Once stored in flash memory, this paper type, selectable by ID m n, remains a valid choice by the set paper type command until firmware flash memory is erased.

Restrictions: If the value of m n = 0 0, then the command will be ignored. It is thus impossible to overwrite the default monochrome paper setting. This command will be ignored if the head type – carried in the description (d1...dx) – is incompatible with the head type in the printer itself or if a description with ID m n already exists.

There is room in firmware flash memory for a maximum of 16 paper type descriptions; of these one is reserved for monochrome descriptions, with m n =0 0 description that is always populated, and factory preloaded of two color descriptions. Thus 13 remaining spaces are free for dynamic use; once these are used up further download paper type descriptions will be ignored, and a firmware reload will be necessary to again free up (except for m n = 0 0) the paper type description space.

GS 0x8F

Function: Return paper type description

Code ASCII: GS 0x8F **m**

Code HEX: 0x1D 0x8F **m**

Range: **m** is the paper type index
 $0 \leq \mathbf{m} \leq 15$

Description: This command will return from flash memory a paper type description indexed by **m**, ($0 \leq \mathbf{m} \leq 15$) sending back the data sequence used in the download paper type description command, i.e. the return is 0x1D 0x8F **m** **n_L** **n_H** (d1...dn) which was stored in slot **m**; or a value of **n** = 0 if slot **m** does not have a description stored. **m** = 0xff asks for a return of the current paper type.

For all valid descriptions, the last two bytes will be a CRC value and the first 24 bytes will be as follows:

| #Bytes | Offset | Definition |
|--------|--------|--|
| 1 | 0 | Manufacturer paper type category |
| 1 | 1 | Version in type category |
| 1 | 2 | Print head type |
| 1 | 3 | Structure format type |
| 20 | 4 | Descriptive name as a null terminated ASCII string |

GS 0xA0

Function: Set temporary max target speed

Code ASCII: GS 0xA0 **n_L** **n_H**

Code HEX: 0x1D 0xA0 **n_L** **n_H**

Range: $0x15 \leq (\mathbf{n}_L + \mathbf{n}_H * 256) \leq 0xDC$ monochrome
 $0x15 \leq (\mathbf{n}_L + \mathbf{n}_H * 256) \leq 0x6E$ color

Default: $(\mathbf{n}_L + \mathbf{n}_H * 256) = 0$ = normal speed

Description: This command sets a specific speed for an operation, allowing the user more control of the print environment.

The speed is maintained as long as it is less than the speed automatically set by power management. A parameter of zero (0) restores the normal max speed.

GS 0xFF

Function: Reset firmware
Code ASCII: GS 0xFF
Code HEX: 0x1D 0xFF
Description: Ends the load process and reboots the printer. Before executing this command, the printer should have firmware loaded and external switches set to the runtime settings. Application software for downloading should prompt the user to set the external switches and confirm before sending this command. If the downloading was started from a diagnostic, the reboot will cause the printer to re-enter download state unless the external switches are changed.

NOTE: PON will not be send by using LAN-Interface

US EOT

Function: Convert 6-dots/mm bitmap to 8-dots/mm bitmap
Code ASCII: US EOT **n**
Code HEX: 0x1F 0x04 **n**
Range: 0 = Off
 1 = On
Default: **n** = 0 (Off)
Description: Selects or cancels 6-dot/mm emulation mode.
 When the 6-dot/mm emulation is selected, logos and graphics are expanded horizontally and vertically during download to emulate their size on a 6-dot/mm printer. The horizontal positioning commands also emulate positioning on a 6-dot/mm printer.

US ENQ

Function: Select superscript or subscript modes
Code ASCII: US 0x05 **n**
Code HEX: 0x1F 0x05 **n**
Range: **n** = 0 = Normal character size
n = 1 = Select subscript size
n = 2 = Select superscript size
Default: **n** = 0 (normal size)
Description: Turns superscript or subscript modes on or off. This attribute may be combined with other characters size settings commands (0x12, 0x13, 0x1B 0x21 **n**, 0x1D 0x21 **n**,...)
Notes:

- This command is ignored if **n** is out of the specified range.

US t**Function:** Print Test Form**Code ASCII:** US t**Code HEX:** 0x1F 0x74**Description:** Prints the current printer configuration settings on the receipt. Disabled in Page Mode.

- Notes:**
- While processing the print test form, it is recommended to wait sending next print data until the actual job is finished.
 - To print the extended test form and the print sample use the command GS (A...
 - Executing this command resets all printer parameter to default (see ESC @)
 - In iPRINT it is possible to print the selftest when closing the cover while pressing the Linefeed button.

US V**Function:** Send printer software version**Code ASCII:** US V**Code HEX:** 0x1F 0x56

Description: The printer returns 8 bytes containing the loader and firmware software version. The first 4 bytes returned are an ASCII string for the loader version. The second 4 bytes are an ASCII string for the firmware version. Example: For 1.034.56 (8 bytes), the loader **version** is **1.03** and the firmware version is **4.56**.

- Notes:**
- New software applications should use the more significant command GS I (see page 149) instead of US V.

US z**Function:** Real time commands disabled**Code ASCII:** US z n**Code HEX:** 0x1F 0x7A n

Range: n = 0 => real time commands enabled
n = 1 => real time commands disabled

Default: n = 0 (real time commands enabled)

Description: This command is used to disable real time commands. They are disabled prior to sending graphics or other data to the printer that may contain embedded real time commands. The disable command (n = 1) is acted on in real time.

The re-enable command (n = 0) is treated as a batch command and processed in the order received.

- Notes:**
- ESC @ (see page 54) does not change the US z real time command setting.

Transmit Status Identification Table

The following table shows the Transmit Status Identification:

| Command & Function | Status Reply |
|---|--------------|
| ESC I (upgrade) | <00011011>B |
| ESC w n 7 | <00011001>B |
| DLE EOT | <0**1**10>B |
| GS ENQ | <1*0*****>B |
| GS I with $1 \leq n \leq 3$; $49 \leq n \leq 51$ | <0**0*****>B |
| GS I with $n \geq 65$ (1 st byte) | <01011111>B |
| GS g 2 (1 st byte) | <01011111>B |
| GS (E with fn = 4 or 6 (1 st byte) | <00110111>B |
| XON | <00010001>B |
| XOFF | <00010011>B |
| ASB (1 st byte) | <0**1**00>B |
| ASB (2 nd to 4 th byte) | <0**0*****>B |
| Power-on notification | <00111011>B |

Printer Parameter Table

The following table shows the possible adjustments and how it can be changed.

| Parameter | | Possible Value Max. Value | Influenced by | Default |
|--|--------------------------|------------------------------|-------------------|------------------------------------|
| BM sensor | | Enabled, Disabled | GS (E | Disabled |
| Endurance Test | | Enabled, Disabled | GS (E | Disabled |
| Serial number | | 0 – 4294967295 | GS (E (fn = 129) | 0 |
| Serial number date | | YYMMDD | GS (E (fn=130) | 0 |
| Paper width | | 80 mm, 82,5 mm | GS (E (fn=5) | 82,5 mm |
| Print density | | 50 % - 130 % | GS (E (fn=5) | 100 % |
| BM adjustment value offset | | 0 – 255 | GS (E (fn=5) | Depends of the printer hardware |
| Sensor values | | 0 – 255 | GS (E (fn=5) | Depends of the printer hardware |
| Maximum power | | Auto or 48 W – 110 W | GS (E (fn=5) | Auto |
| Maximum speed | | 70 – 220 mm/sec | GS (E (fn=5) | 220 mm/sec |
| Max speed TH230+ Draft | | 70 – 300 mm/sec | GS (E (fn=5) | 220 mm/sec |
| Number of Endurance test tickets | | 1 – 65535 Tickets | GS (E (fn=5) | 100 Tickets |
| Paper selection | | Single color, Two color | GS 0x81 | Single color |
| Firmware version | | 00.00 - 99.99 | no | Depends of the firmware version |
| Maintenance Counter for the whole printer life. | Linefeeds (total) | 0 - 4294967295 | no | 0 |
| | Dots (total) | 0 - 4294967295 | no | 0 |
| | Cuts (total) | 0 - 4294967295 | no | 0 |
| | Firmware start cycles | 0 - 4294967295 | no | 0 |
| | Power on hours | 0 - 1000000000 | no | 0 |
| | EEPROM update cycles | 0 - 4294967295 | no | 0 |
| | Cutter Errors | 0 - 65535 | GS g 0 | 0 |
| | Black Mark Errors | 0 - 65535 | GS g 0 | 0 |
| | Thermistor Errors | 0 - 65535 | GS g 0 | 0 |
| | Low Voltage Errors | 0 - 65535 | GS g 0 | 0 |
| | | | | |

| | | | | |
|---|---------------------------------|----------------|--------|---|
| | | | | |
| | High Voltage Errors | 0 - 65535 | GS g 0 | 0 |
| | Cover Open Counter | 0 - 65535 | GS g 0 | 0 |
| | Maximum Head Temperature | 0 - 255 | GS g 0 | 0 |
| Reset able Maintenance Counter for replaced spare parts. | Linefeeds | 0 - 4294967295 | GS g 0 | 0 |
| | Dots | 0 - 4294967295 | GS g 0 | 0 |
| | Cuts | 0 - 4294967295 | GS g 0 | 0 |
| Counter for replacements of spare parts. | Linefeed mechanism | 0 - 255 | GS g 0 | 0 |
| | Print head | 0 - 255 | GS g 0 | 0 |
| | Cutter unit | 0 - 255 | GS g 0 | 0 |

Character Sets and Fonts

Representation of the printed data

Character Fonts

The character fonts will be selected by an escape command.

The controller provides two character sets with different character densities. The dimensions (W*H) of the character cell are as follows:

Font A 13 * 24 Dots
Font B 10 * 24 Dots

The character density will be determined by the character spacing between two adjacent character cells.

The character densities are determined by the control commands ESC SP (see page 38). The following tables give an overview regarding some print densities:

Thermal Printer on 80 mm Paper:

| Characters per line [cpl] | Font | Character Dimension W * H | Spacing set by the command ESC SP (see page 38). | Character size incl. spacing [mm] B * H | Used dots per Line | Print area per Line (max. 72 mm = 576 dot) [mm] | Character Density [cpi] |
|---------------------------|------|---------------------------|--|---|--------------------|---|-------------------------|
| 44 | A | 13 * 24 | 0 * | 1.625 * 3 | 572 | 71.50 | 15.6 |
| 41 | A | 13 * 24 | 1 | 1.75 * 3 | 574 | 71.75 | 14.5 |
| 38 | A | 13 * 24 | 2 | 1.875 * 3 | 570 | 71.25 | 13.5 |
| 57 | B | 10 * 24 | 0 * | 1.25 * 3 | 570 | 71.25 | 20.3 |
| 52 | B | 10 * 24 | 1 | 1.375 * 3 | 572 | 71.50 | 18.5 |

* = Default character spacing

Thermal Printer on 57.5 mm Paper:

| Characters per line [cpl] | Font | Character Dimension W * H | Spacing set by the command ESC SP (see page 38). | Character size incl. spacing [mm] B * H | Used dots per Line | Print area per Line (max. 51 mm = 408 dot) [mm] | Character Density [cpi] |
|---------------------------|------|---------------------------|--|---|--------------------|---|-------------------------|
| 31 | A | 13 * 24 | 0 * | 1.625 * 3 | 403 | 50.38 | 15.6 |
| 29 | A | 13 * 24 | 1 | 1.75 * 3 | 406 | 50.75 | 14.5 |
| 27 | A | 13 * 24 | 2 | 1.875 * 3 | 405 | 50.63 | 13.5 |
| 40 | B | 10 * 24 | 0 * | 1.25 * 3 | 400 | 50.00 | 20,3 |
| 37 | B | 10 * 24 | 1 | 1.375 * 3 | 407 | 50.88 | 18.5 |

* = Default character spacing

User defined character sets

User defined character could be loaded in RAM (default) or in flash-memory (GS “) by the sequence ESC &. It is possible to define one page (font A and font B) from the character code 20H to the character code FFH (16x24). Depend from the storage (RAM or flash) characters are available or not after power off.

The flash-memory works like a backup medium for the RAM. If a font defined in flash and not in RAM, the RAM will be update. The user defined character will be read only from the RAM. GS “ define the storage destination of user characters but it is read only from the RAM. If flash chosen as storage destination but the character is in RAM already defined, the RAM character will be overwritten with the flash character. On the other hand, a definition in RAM can't overwrite a definition in flash.

Character code tables

Standard Code Pages - Overview

Following character code tables are standard and can be selected by sequence ESC t and ESC R:

| Number | Character code table |
|--------|-------------------------------|
| 0 | PC437 (USA, Standard Europe) |
| 1 | PC850 (Multilingual Latin I) |
| 2 | PC852 (Latin II) |
| 3 | PC860 (Portuguese) |
| 4 | PC863 (Canadian French) |
| 5 | PC865 (Nordic) |
| 6 | PC858 (Multilingual I + Euro) |
| 7 | PC866 (Russian) |
| 8 | WPC1252 (Latin I) |
| 9 | PC862 (Hebrew) |
| 10 | PC737 (Greek) |
| 11 | PC874 (Thai) |
| 12 | PC857 (Turkish) |
| 16 | WPC1254 (Turkish) |
| 17 | WPC1250 (Central Europe) |
| 18 | WPC28591 (Latin 1) |
| 19 | WPC28592 (Latin 2) |
| 20 | WPC28599 (Turkish) |
| 21 | WPC28605 (Latin 9) |
| 22 | PC864 (Arabic) |
| 23 | PC720 (Arabic) |
| 24 | WPC1256 (Arabic) |
| 25 | WPC28596 (Arabic) |
| 26 | KATAKANA (Asia) |
| 27 | PC775 (Baltic) |
| 28 | WPC1257 (Baltic) |
| 29 | WPC28594 (Baltic) |

All codepages contains printable characters from 0x80 to 0xFF except PC437, which runs from 0x20 to 0xFF. There are no international pages supported.

Standard code pages – Definition for USB Loader

Character Set Structure

This Structure is divided into two blocks. The first block is the header of the loader (See document [R1] "TH230 - Firmware Upgrade Concept"). At offset 64 begins the second block with character set data. All Offsets in this and next structures are relative pointer with base of the beginning from first block (offset 0). Name fields can be up to 16 characters and must be terminated by zero. If the length of Name smaller the 16, an additional terminator with value zero must be set after end of Name. All Reserved bytes must be zero.

| Offset | Field | Size | Description |
|--------|-------------------|------|--|
| 0 | Identifier | 5 | Module identifier ('\$MOD\$') |
| 5 | Separator | 1 | Blank (0x20) |
| 6 | Date | 6 | Release date with the format 'YYMMDD' ('020301' for 1.03.02) |
| 12 | Separator | 1 | Blank (0x20) |
| 13 | Version | 4 | Release and release version ('0105' for V01.05) |
| 17 | Separator | 1 | Blank (0x20) |
| 18 | Name | 8 | Module name (e.g. 'TH230__') |
| 26 | Separator | 1 | Dot ('.') |
| 27 | Extension | 3 | Extension ('FNT' for standard code pages) |
| 30 | Separator | 1 | String terminator (0x00) |
| 31 | Length | 3 | Module data length |
| 34 | Checksum | 4 | 32-bit checksum |
| 38 | Reserved | 26 | Reserved |
| 64 | Name | 16 | Name of this Character Set |
| 80 | Separator | 1 | String terminator (0x00) |
| 81 | TypeID | 1 | Character Set Type ID (= 1 Thermo) |
| 82 | CodeTableNumber | 1 | Number of entries in Code Table Array |
| 83 | Reserved | 5 | Reserved |
| 88 | OffsetInterFontA | 4 | Offset to International Code Table Structure FontA |
| 92 | OffsetInterFontB | 4 | Offset to International Code Table Structure FontB |
| 96 | CodeTableArray[n] | N*28 | Code table array |
| | Name | 16 | Name of this Code Table Page |
| | Separator | 1 | String terminator (0x00) |
| | Reserved | 3 | Reserved |
| | OffsetFontA | 4 | Offset to Code Table Structure for FontA (= 0 no font) |
| | OffsetFontB | 4 | Offset to Code Table Structure for FontB (= 0 no font) |

Code Table Structure

| Offset | Field | Size | Description |
|---------------|------------------------|-------------|--|
| 0 | <i>FirstCharacter</i> | 1 | ASCII value of first character |
| 1 | <i>LastCharacter</i> | 1 | ASCII value of last character |
| 2 | <i>CharacterWidth</i> | 1 | Width of character in pixels |
| 3 | <i>CharacterHeight</i> | 1 | Height of character in pixels |
| 4 | <i>MinSpacing</i> | 1 | Minimal spacing between characters |
| 5 | <i>Reserved</i> | 3 | Reserved |
| 8 | <i>CharImage[n]</i> | n*8 | Character image(n) (max n = LastCharacter – FirstCharacter + 1) |
| | <i>International</i> | 1 | Index for International Code Table (= 0 not international) |
| | <i>Reserved</i> | 3 | Reserved |
| | <i>Offset</i> | 4 | Offset to Character Image |

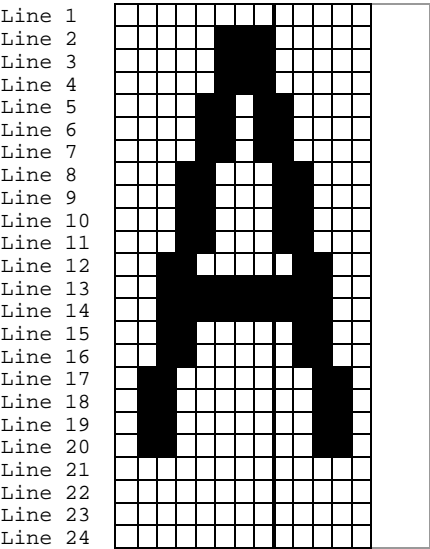
International Code Table Structure

| Offset | Field | Size | Description |
|---------------|------------------------|-------------|---|
| 0 | <i>CharacterNumber</i> | 1 | Number of characters for one country |
| 1 | <i>CountryNumber</i> | 1 | Number of countries |
| 2 | <i>CharacterWidth</i> | 1 | Width of character in pixels |
| 3 | <i>CharacterHeight</i> | 1 | Height of character in pixels |
| 4 | <i>MinSpacing</i> | 1 | Minimal spacing between characters |
| 5 | <i>Reserved</i> | 3 | Reserved |
| 8 | <i>CharImage[n]</i> | N*4 | Character image(n) (max n = CharacterNumber * CountryNumber) |
| | <i>Offset</i> | 4 | Offset to Character Image |

Character Image 13 x 24 (Thermo)

| Line | Bits | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|---------|---------|---------|---|---|---|---|---|---|-----|---------|---------|---|---|---|---|---|---|-----|--|--|--|
| | MSB | Byte 2 | | | | | | | LSB | MSB | Byte 1 | | | | | | | LSB | | | |
| | Line 2 | Byte 4 | | | | | | | | | Byte 3 | | | | | | | | | | |
| | Line 3 | Byte 6 | | | | | | | | | Byte 5 | | | | | | | | | | |
| | Line 4 | Byte 8 | | | | | | | | | Byte 7 | | | | | | | | | | |
| | Line 5 | Byte 10 | | | | | | | | | Byte 9 | | | | | | | | | | |
| | Line 6 | Byte 12 | | | | | | | | | Byte 11 | | | | | | | | | | |
| | Line 7 | Byte 14 | | | | | | | | | Byte 13 | | | | | | | | | | |
| | Line 8 | Byte 16 | | | | | | | | | Byte 15 | | | | | | | | | | |
| | Line 9 | Byte 18 | | | | | | | | | Byte 17 | | | | | | | | | | |
| | Line 10 | Byte 20 | | | | | | | | | Byte 19 | | | | | | | | | | |
| | Line 11 | Byte 22 | | | | | | | | | Byte 21 | | | | | | | | | | |
| | Line 12 | Byte 24 | | | | | | | | | Byte 23 | | | | | | | | | | |
| | Line 13 | Byte 26 | | | | | | | | | Byte 25 | | | | | | | | | | |
| | Line 14 | Byte 28 | | | | | | | | | Byte 27 | | | | | | | | | | |
| | Line 15 | Byte 30 | | | | | | | | | Byte 29 | | | | | | | | | | |
| | Line 16 | Byte 32 | | | | | | | | | Byte 31 | | | | | | | | | | |
| | Line 17 | Byte 34 | | | | | | | | | Byte 33 | | | | | | | | | | |
| | Line 18 | Byte 36 | | | | | | | | | Byte 35 | | | | | | | | | | |
| | Line 19 | Byte 38 | | | | | | | | | Byte 37 | | | | | | | | | | |
| | Line 20 | Byte 40 | | | | | | | | | Byte 39 | | | | | | | | | | |
| | Line 21 | Byte 42 | | | | | | | | | Byte 41 | | | | | | | | | | |
| | Line 22 | Byte 44 | | | | | | | | | Byte 43 | | | | | | | | | | |
| | Line 23 | Byte 46 | | | | | | | | | Byte 45 | | | | | | | | | | |
| Line 24 | Byte 48 | | | | | | | | | Byte 47 | | | | | | | | | | | |

Example:



```

0x00, 0x00, 0x00, 0x07, 0x00, 0x07, 0x00, 0x07,
0x80, 0x0D, 0x80, 0x0D, 0x80, 0x0D, 0xC0, 0x18,
0xC0, 0x18, 0xC0, 0x18, 0xC0, 0x18, 0x60, 0x30,
0xE0, 0x3F, 0xE0, 0x3F, 0x60, 0x30, 0x60, 0x30,
0x30, 0x60, 0x30, 0x60, 0x30, 0x60, 0x30, 0x60,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00
    
```

Character Image 10 x 24 (Thermo)

| Bits | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|---------|---------|---|---|--------|---|---|---|-----|-----|---------|---|---|---|---|---|---|-----|
| Line 1 | MSB | | | Byte 2 | | | | LSB | MSB | Byte 1 | | | | | | | LSB |
| Line 2 | Byte 4 | | | | | | | | | Byte 3 | | | | | | | |
| Line 3 | Byte 6 | | | | | | | | | Byte 5 | | | | | | | |
| Line 4 | Byte 8 | | | | | | | | | Byte 7 | | | | | | | |
| Line 5 | Byte 10 | | | | | | | | | Byte 9 | | | | | | | |
| Line 6 | Byte 12 | | | | | | | | | Byte 11 | | | | | | | |
| Line 7 | Byte 14 | | | | | | | | | Byte 13 | | | | | | | |
| Line 8 | Byte 16 | | | | | | | | | Byte 15 | | | | | | | |
| Line 9 | Byte 18 | | | | | | | | | Byte 17 | | | | | | | |
| Line 10 | Byte 20 | | | | | | | | | Byte 19 | | | | | | | |
| Line 11 | Byte 22 | | | | | | | | | Byte 21 | | | | | | | |
| Line 12 | Byte 24 | | | | | | | | | Byte 23 | | | | | | | |
| Line 13 | Byte 26 | | | | | | | | | Byte 25 | | | | | | | |
| Line 14 | Byte 28 | | | | | | | | | Byte 27 | | | | | | | |
| Line 15 | Byte 30 | | | | | | | | | Byte 29 | | | | | | | |
| Line 16 | Byte 32 | | | | | | | | | Byte 31 | | | | | | | |
| Line 17 | Byte 34 | | | | | | | | | Byte 33 | | | | | | | |
| Line 18 | Byte 36 | | | | | | | | | Byte 35 | | | | | | | |
| Line 19 | Byte 38 | | | | | | | | | Byte 37 | | | | | | | |
| Line 20 | Byte 40 | | | | | | | | | Byte 39 | | | | | | | |
| Line 21 | Byte 42 | | | | | | | | | Byte 41 | | | | | | | |
| Line 22 | Byte 44 | | | | | | | | | Byte 43 | | | | | | | |
| Line 23 | Byte 46 | | | | | | | | | Byte 45 | | | | | | | |
| Line 24 | Byte 48 | | | | | | | | | Byte 47 | | | | | | | |

Example:

Line 1

Line 2

Line 3

Line 4

Line 5

Line 6

Line 7

Line 8

Line 9

Line 10

Line 11

Line 12

Line 13

Line 14

Line 15

Line 16

Line 17

Line 18

Line 19

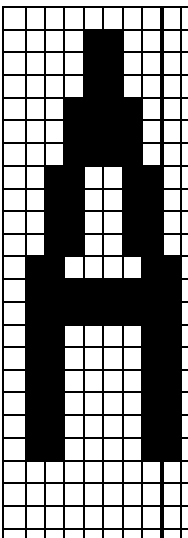
Line 20

Line 21

Line 22

Line 23

Line 24

A 24x24 grid with a black pattern forming a stylized letter 'H'. The pattern is composed of black squares on a white background. The 'H' is formed by a vertical bar on the left (columns 1-2), a vertical bar on the right (columns 23-24), and a horizontal bar in the middle (rows 12-13). The horizontal bar is 22 squares wide, spanning from column 2 to column 23. The vertical bars are 2 squares wide each, spanning from row 1 to row 24. The intersection of the vertical and horizontal bars is a 4x4 square area (rows 12-13, columns 2-5 and columns 20-23).

```
0x00, 0x00, 0x00, 0x0C, 0x00, 0x0C, 0x00, 0x0C,
0x00, 0x1E, 0x00, 0x1E, 0x00, 0x1E, 0x00, 0x33,
0x00, 0x33, 0x00, 0x33, 0x00, 0x33, 0x80, 0x61,
0x80, 0x7F, 0x80, 0x7F, 0x80, 0x61, 0x80, 0x61,
0x80, 0x61, 0x80, 0x61, 0x80, 0x61, 0x80, 0x61,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00
```

Standard code pages - tables

In the following tables the implemented code pages are shown:

Character code table Page 0 (PC437: USA, Standard Europe):

| HEX | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 000 | 016 | 032 | 048 | 064 | 080 | 096 | 112 |
| 1 | 001 | 017 | 033 | 049 | 065 | 081 | 097 | 113 |
| 2 | 002 | 018 | 034 | 050 | 066 | 082 | 098 | 114 |
| 3 | 003 | 019 | 035 | 051 | 067 | 083 | 099 | 115 |
| 4 | 004 | 020 | 036 | 052 | 068 | 084 | 100 | 116 |
| 5 | 005 | 021 | 037 | 053 | 069 | 085 | 101 | 117 |
| 6 | 006 | 022 | 038 | 054 | 070 | 086 | 102 | 118 |
| 7 | 007 | 023 | 039 | 055 | 071 | 087 | 103 | 119 |
| 8 | 008 | 024 | 040 | 056 | 072 | 088 | 104 | 120 |
| 9 | 009 | 025 | 041 | 057 | 073 | 089 | 105 | 121 |
| A | 010 | 026 | 042 | 058 | 074 | 090 | 106 | 122 |
| B | 011 | 027 | 043 | 059 | 075 | 091 | 107 | 123 |
| C | 012 | 028 | 044 | 060 | 076 | 092 | 108 | 124 |
| D | 013 | 029 | 045 | 061 | 077 | 093 | 109 | 125 |
| E | 014 | 030 | 046 | 062 | 078 | 094 | 110 | 126 |
| F | 015 | 031 | 047 | 063 | 079 | 095 | 111 | 127 |

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Character code table Page 1 (PC850: Multilingual Latin I):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | Ç 128 | É 144 | á 160 | ≡ 176 | Ł 192 | ø 208 | Ó 224 | - 240 |
| 1 | Ü 129 | æ 145 | í 161 | ≡ 177 | Ł 193 | Ð 209 | ß 225 | ± 241 |
| 2 | é 130 | Æ 146 | ó 162 | ≡ 178 | Ł 194 | Ê 210 | Ô 226 | ² 242 |
| 3 | â 131 | ô 147 | ú 163 | Ł 179 | Ł 195 | Ë 211 | Ö 227 | ¼ 243 |
| 4 | ä 132 | ö 148 | ñ 164 | Ł 180 | - 196 | È 212 | Ø 228 | ¶ 244 |
| 5 | à 133 | ò 149 | ñ 165 | À 181 | Ł 197 | Ì 213 | Ö 229 | § 245 |
| 6 | â 134 | Ü 150 | ª 166 | À 182 | ä 198 | Í 214 | µ 230 | ÷ 246 |
| 7 | ç 135 | ü 151 | º 167 | À 183 | Ä 199 | Î 215 | þ 231 | ¿ 247 |
| 8 | ê 136 | ÿ 152 | ¿ 168 | © 184 | Ł 200 | Ï 216 | ð 232 | ° 248 |
| 9 | ë 137 | ÿ 153 | © 169 | Ł 185 | Ł 201 | Ĵ 217 | Û 233 | ² 249 |
| A | è 138 | Ü 154 | ¬ 170 | Ł 186 | Ł 202 | Œ 218 | Ü 234 | · 250 |
| B | ÿ 139 | ø 155 | ½ 171 | Ł 187 | Ł 203 | ■ 219 | Ü 235 | ¹ 251 |
| C | ï 140 | £ 156 | ¼ 172 | Ł 188 | Ł 204 | ■ 220 | ý 236 | ³ 252 |
| D | ı 141 | ø 157 | ı 173 | ¢ 189 | = 205 | ı 221 | ÿ 237 | ² 253 |
| E | À 142 | × 158 | « 174 | ¥ 190 | Ł 206 | İ 222 | - 238 | ■ 254 |
| F | Å 143 | ƒ 159 | » 175 | Ł 191 | Ł 207 | ■ 223 | · 239 | 255 |

Character code table Page 2 (PC852: Latin II):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | Ç 128 | É 144 | Á 160 | ⋯ 176 | Ł 192 | đ 208 | Ó 224 | - 240 |
| 1 | Ú 129 | Ĺ 145 | Į 161 | ⋮ 177 | Ł 193 | Đ 209 | Ȯ 225 | ~ 241 |
| 2 | é 130 | Í 146 | ó 162 | ⋮ 178 | Ł 194 | Đ 210 | Ó 226 | 242 |
| 3 | à 131 | ò 147 | ú 163 | ı 179 | Ł 195 | Ė 211 | Ń 227 | · 243 |
| 4 | ä 132 | ö 148 | À 164 | ı 180 | - 196 | đ 212 | ñ 228 | · 244 |
| 5 | û 133 | Ľ 149 | ą 165 | Ą 181 | Ł 197 | Ń 213 | ñ 229 | š 245 |
| 6 | ć 134 | ĩ 150 | ž 166 | Ą 182 | Ą 198 | ĩ 214 | š 230 | ÷ 246 |
| 7 | ç 135 | š 151 | ž 167 | Ė 183 | ä 199 | ı 215 | š 231 | 247 |
| 8 | ı 136 | ś 152 | Ę 168 | Ś 184 | Ł 200 | é 216 | Ř 232 | ° 248 |
| 9 | ë 137 | ö 153 | ę 169 | Ĳ 185 | Ł 201 | ı 217 | Ů 233 | · 249 |
| A | ő 138 | Ů 154 | ˘ 170 | Ĳ 186 | Ł 202 | ı 218 | ř 234 | · 250 |
| B | ő 139 | ı 155 | ž 171 | Ĳ 187 | Ł 203 | ı 219 | Ů 235 | Ů 251 |
| C | ı 140 | ı 156 | č 172 | Ĳ 188 | Ł 204 | ı 220 | Ů 236 | Ř 252 |
| D | ž 141 | ł 157 | š 173 | ž 189 | = 205 | ı 221 | Ů 237 | ř 253 |
| E | À 142 | × 158 | « 174 | ž 190 | ı 206 | Ů 222 | ı 238 | ■ 254 |
| F | Ć 143 | č 159 | » 175 | ı 191 | ı 207 | ı 223 | · 239 | 255 |

Character code table Page 3 (PC860: Portuguese):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | Ç 128 | É 144 | Á 160 | ≡ 176 | Ł 192 | „ 208 | α 224 | ≡ 240 |
| 1 | Ü 129 | À 145 | Í 161 | ⌘ 177 | ┐ 193 | ⌘ 209 | Β 225 | ± 241 |
| 2 | é 130 | Ê 146 | Ó 162 | ⌘ 178 | ┐ 194 | ⌘ 210 | Γ 226 | ≥ 242 |
| 3 | â 131 | ô 147 | Û 163 | ┐ 179 | ┐ 195 | „ 211 | π 227 | ≤ 243 |
| 4 | ã 132 | õ 148 | ñ 164 | ┐ 180 | — 196 | Ł 212 | Σ 228 | ┐ 244 |
| 5 | ä 133 | ö 149 | ñ 165 | ┐ 181 | ┐ 197 | „ 213 | σ 229 | ┐ 245 |
| 6 | Á 134 | Û 150 | ª 166 | ⌘ 182 | Ł 198 | „ 214 | μ 230 | ÷ 246 |
| 7 | Ç 135 | Ü 151 | º 167 | ⌘ 183 | ┐ 199 | ⌘ 215 | τ 231 | ≈ 247 |
| 8 | ê 136 | ı 152 | ı 168 | ı 184 | „ 200 | Ł 216 | Φ 232 | ° 248 |
| 9 | Ê 137 | ö 153 | ò 169 | ⌘ 185 | „ 201 | ┐ 217 | θ 233 | • 249 |
| A | è 138 | Û 154 | ¬ 170 | ⌘ 186 | „ 202 | ┐ 218 | Ω 234 | · 250 |
| B | í 139 | Φ 155 | ½ 171 | ⌘ 187 | „ 203 | ⌘ 219 | δ 235 | √ 251 |
| C | ó 140 | £ 156 | ¼ 172 | „ 188 | „ 204 | ⌘ 220 | ω 236 | π 252 |
| D | ı 141 | Û 157 | ı 173 | „ 189 | = 205 | ⌘ 221 | φ 237 | ² 253 |
| E | Ä 142 | Π 158 | « 174 | ı 190 | ⌘ 206 | ⌘ 222 | ε 238 | ■ 254 |
| F | Å 143 | Ó 159 | » 175 | ı 191 | ┐ 207 | ■ 223 | ∩ 239 | ■ 255 |

Character code table Page 4 (PC863: Canadian French):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | Ç 128 | É 144 | Ì 160 | Ï 176 | Ì 192 | Ï 208 | α 224 | ≡ 240 |
| 1 | Ù 129 | Ê 145 | Í 161 | Î 177 | ± 193 | ± 209 | Β 225 | ± 241 |
| 2 | é 130 | Ê 146 | ó 162 | Ï 178 | ± 194 | ± 210 | Γ 226 | ≥ 242 |
| 3 | â 131 | ô 147 | Û 163 | Ì 179 | ± 195 | ± 211 | Π 227 | ≤ 243 |
| 4 | À 132 | Ê 148 | · 164 | ± 180 | ± 196 | ± 212 | Σ 228 | ± 244 |
| 5 | à 133 | Ï 149 | · 165 | ± 181 | ± 197 | ± 213 | σ 229 | ± 245 |
| 6 | ¶ 134 | Ù 150 | ³ 166 | ± 182 | ± 198 | ± 214 | ± 230 | ÷ 246 |
| 7 | Ç 135 | Ù 151 | · 167 | ± 183 | ± 199 | ± 215 | ± 231 | ± 247 |
| 8 | è 136 | ± 152 | ± 168 | ± 184 | ± 200 | ± 216 | Φ 232 | ° 248 |
| 9 | è 137 | ó 153 | ± 169 | ± 185 | ± 201 | ± 217 | θ 233 | ° 249 |
| A | è 138 | Ù 154 | ± 170 | ± 186 | ± 202 | ± 218 | Ω 234 | · 250 |
| B | Û 139 | Φ 155 | ½ 171 | ± 187 | ± 203 | ± 219 | δ 235 | √ 251 |
| C | í 140 | £ 156 | ¼ 172 | ± 188 | ± 204 | ± 220 | ω 236 | π 252 |
| D | ± 141 | Ù 157 | ¼ 173 | ± 189 | ± 205 | ± 221 | φ 237 | ² 253 |
| E | À 142 | Ù 158 | « 174 | ± 190 | ± 206 | ± 222 | ε 238 | ■ 254 |
| F | § 143 | ± 159 | » 175 | ± 191 | ± 207 | ± 223 | ∩ 239 | ± 255 |

Character code table Page 5 (PC865: Nordic):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | Ç 128 | É 144 | Á 160 | ⋮ 176 | Ł 192 | Ț 208 | α 224 | ≡ 240 |
| 1 | Û 129 | æ 145 | í 161 | ⋮ 177 | ± 193 | ≡ 209 | ß 225 | ± 241 |
| 2 | é 130 | Æ 146 | ó 162 | ⋮ 178 | Ț 194 | Ț 210 | Γ 226 | ≥ 242 |
| 3 | â 131 | ô 147 | ú 163 | ı 179 | ı 195 | Ț 211 | π 227 | ≤ 243 |
| 4 | ä 132 | ö 148 | ñ 164 | ı 180 | — 196 | Ț 212 | Σ 228 | ı 244 |
| 5 | à 133 | ò 149 | ñ 165 | ı 181 | ı 197 | Ț 213 | σ 229 | ı 245 |
| 6 | â 134 | û 150 | ä 166 | ı 182 | ı 198 | Ț 214 | μ 230 | ÷ 246 |
| 7 | ç 135 | ü 151 | ö 167 | ı 183 | ı 199 | Ț 215 | τ 231 | ≈ 247 |
| 8 | ê 136 | ÿ 152 | ı 168 | ı 184 | Ț 200 | ı 216 | Φ 232 | ° 248 |
| 9 | ë 137 | ö 153 | ı 169 | ı 185 | Ț 201 | ı 217 | θ 233 | • 249 |
| A | è 138 | Û 154 | ı 170 | ı 186 | Ț 202 | Ț 218 | Ω 234 | · 250 |
| B | ÿ 139 | ø 155 | ı 171 | ı 187 | Ț 203 | ı 219 | δ 235 | √ 251 |
| C | ı 140 | £ 156 | ı 172 | ı 188 | Ț 204 | ı 220 | ω 236 | ı 252 |
| D | ı 141 | ø 157 | ı 173 | ı 189 | ı 205 | ı 221 | φ 237 | ² 253 |
| E | Ä 142 | ı 158 | « 174 | ı 190 | ı 206 | ı 222 | ε 238 | ı 254 |
| F | Å 143 | ı 159 | ı 175 | ı 191 | ı 207 | ı 223 | ı 239 | ı 255 |

Character code table Page 6 (PC858: Multilingual I + Euro):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|------------|----------|----------|----------|----------|
| 0 | Ç 128 | É 144 | Á 160 | ... 176 | Ł 192 | Đ 208 | Ó 224 | - 240 |
| 1 | Ü 129 | Æ 145 | Í 161 | ... 177 | Ł 193 | Đ 209 | ß 225 | ± 241 |
| 2 | é 130 | Æ 146 | ó 162 | ... 178 | Ł 194 | É 210 | Ô 226 | ² 242 |
| 3 | à 131 | ô 147 | ú 163 | 179 | Ł 195 | Ê 211 | Ò 227 | ³ 243 |
| 4 | ä 132 | ö 148 | ñ 164 | ¡ 180 | - 196 | È 212 | Ö 228 | ¶ 244 |
| 5 | à 133 | ò 149 | Ñ 165 | À 181 | † 197 | Ê 213 | Õ 229 | § 245 |
| 6 | ä 134 | ü 150 | ª 166 | À 182 | ä 198 | Í 214 | µ 230 | ÷ 246 |
| 7 | ç 135 | ü 151 | º 167 | À 183 | À 199 | Î 215 | þ 231 | ² 247 |
| 8 | ê 136 | ý 152 | ¿ 168 | © 184 | Ł 200 | Î 216 | þ 232 | ° 248 |
| 9 | ë 137 | ö 153 | © 169 | ¶ 185 | Ł 201 | Ĵ 217 | Û 233 | ˆ 249 |
| A | è 138 | Ü 154 | ¬ 170 | ¶ 186 | Ł 202 | Γ 218 | Ü 234 | · 250 |
| B | ÿ 139 | ø 155 | ½ 171 | ¶ 187 | Ł 203 | ■ 219 | Û 235 | ¹ 251 |
| C | í 140 | £ 156 | ¼ 172 | ¶ 188 | Ł 204 | ■ 220 | ý 236 | ³ 252 |
| D | ï 141 | Ø 157 | í 173 | ¢ 189 | = 205 | ¡ 221 | ÿ 237 | ² 253 |
| E | Ä 142 | × 158 | « 174 | ¥ 190 | ¶ 206 | Î 222 | - 238 | ■ 254 |
| F | Å 143 | ƒ 159 | » 175 | ₹ 191 | ¶ 207 | ■ 223 | · 239 | ² 255 |

Character code table Page 7 (PC866: Russian):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|------------|----------|----------|----------|----------|
| 0 | А 128 | Р 144 | а 160 | ... 176 | Л 192 | л 208 | р 224 | ё 240 |
| 1 | Б 129 | С 145 | б 161 | ... 177 | л 193 | т 209 | с 225 | ё 241 |
| 2 | В 130 | Т 146 | в 162 | ... 178 | т 194 | т 210 | т 226 | ё 242 |
| 3 | Г 131 | У 147 | г 163 | л 179 | т 195 | ц 211 | у 227 | ё 243 |
| 4 | Д 132 | Ф 148 | д 164 | л 180 | — 196 | т 212 | ф 228 | т 244 |
| 5 | Е 133 | Х 149 | е 165 | л 181 | т 197 | р 213 | х 229 | і 245 |
| 6 | Ж 134 | Ц 150 | ж 166 | л 182 | т 198 | т 214 | ц 230 | у 246 |
| 7 | З 135 | Ч 151 | з 167 | л 183 | т 199 | т 215 | ч 231 | у 247 |
| 8 | И 136 | Ш 152 | и 168 | л 184 | т 200 | т 216 | ш 232 | ° 248 |
| 9 | Й 137 | Щ 153 | й 169 | л 185 | т 201 | т 217 | щ 233 | ° 249 |
| A | К 138 | Ъ 154 | к 170 | л 186 | т 202 | т 218 | ъ 234 | · 250 |
| B | Л 139 | Ы 155 | л 171 | л 187 | т 203 | т 219 | ы 235 | √ 251 |
| C | М 140 | Ь 156 | м 172 | л 188 | т 204 | т 220 | ь 236 | № 252 |
| D | Н 141 | Э 157 | н 173 | л 189 | = 205 | т 221 | э 237 | ¤ 253 |
| E | О 142 | Ю 158 | о 174 | л 190 | т 206 | т 222 | ю 238 | ■ 254 |
| F | П 143 | Я 159 | п 175 | л 191 | т 207 | т 223 | я 239 | ■ 255 |

Character code table Page 8 (WPC1252: Latin I):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | € 128 | | | ° 176 | À 192 | Ð 208 | à 224 | ø 240 |
| 1 | | ` 129 | í 161 | ± 177 | Á 193 | Ñ 209 | á 225 | ñ 241 |
| 2 | | ´ 130 | ¢ 162 | ² 178 | Â 194 | Ò 210 | â 226 | ò 242 |
| 3 | ƒ 131 | " 147 | £ 163 | ³ 179 | Ã 195 | Ó 211 | ã 227 | ó 243 |
| 4 | ¸ 132 | " 148 | ¤ 164 | ´ 180 | Ä 196 | Ô 212 | ä 228 | ô 244 |
| 5 | … 133 | · 149 | ¥ 165 | µ 181 | Å 197 | Ö 213 | å 229 | ö 245 |
| 6 | † 134 | - 150 | ¦ 166 | ¶ 182 | Æ 198 | Ø 214 | æ 230 | ø 246 |
| 7 | ‡ 135 | - 151 | § 167 | · 183 | Ç 199 | × 215 | ç 231 | ÷ 247 |
| 8 | ^ 136 | ˘ 152 | ¨ 168 | ¸ 184 | È 200 | Ø 216 | è 232 | ø 248 |
| 9 | ‰ 137 | ™ 153 | © 169 | ¹ 185 | É 201 | Ù 217 | é 233 | ù 249 |
| A | Š 138 | š 154 | ª 170 | º 186 | Ê 202 | Ú 218 | ê 234 | ú 250 |
| B | < 139 | > 155 | « 171 | » 187 | Ë 203 | Û 219 | ë 235 | û 251 |
| C | Œ 140 | œ 156 | ¬ 172 | ¼ 188 | Ì 204 | Ü 220 | ì 236 | ü 252 |
| D | | | ¬ 173 | ½ 189 | Í 205 | Ý 221 | í 237 | ý 253 |
| E | Ž 142 | ž 158 | ® 174 | ¾ 190 | Î 206 | Þ 222 | î 238 | þ 254 |
| F | | ÿ 159 | - 175 | ¿ 191 | Ï 207 | ß 223 | ÿ 239 | ÿ 255 |

Character code table Page 9 (PC862: Hebrew):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | א 128 | ב 144 | ג 160 | ד 176 | ה 192 | ו 208 | ז 224 | ח 240 |
| 1 | ט 129 | י 145 | כ 161 | ל 177 | מ 193 | נ 209 | ס 225 | ע 241 |
| 2 | פ 130 | צ 146 | ק 162 | ר 178 | ש 194 | ת 210 | י 226 | ך 242 |
| 3 | ף 131 | ץ 147 | ן 163 | ם 179 | נ 195 | ס 211 | ע 227 | פ 243 |
| 4 | ץ 132 | כ 148 | ל 164 | מ 180 | נ 196 | ס 212 | ע 228 | פ 244 |
| 5 | ך 133 | ף 149 | ק 165 | ר 181 | ש 197 | ת 213 | י 229 | ך 245 |
| 6 | ץ 134 | כ 150 | ל 166 | מ 182 | נ 198 | ס 214 | ע 230 | פ 246 |
| 7 | ץ 135 | כ 151 | ל 167 | מ 183 | נ 199 | ס 215 | ע 231 | פ 247 |
| 8 | ץ 136 | כ 152 | ל 168 | מ 184 | נ 200 | ס 216 | ע 232 | פ 248 |
| 9 | ץ 137 | כ 153 | ל 169 | מ 185 | נ 201 | ס 217 | ע 233 | פ 249 |
| A | ץ 138 | כ 154 | ל 170 | מ 186 | נ 202 | ס 218 | ע 234 | פ 250 |
| B | ץ 139 | כ 155 | ל 171 | מ 187 | נ 203 | ס 219 | ע 235 | פ 251 |
| C | ץ 140 | כ 156 | ל 172 | מ 188 | נ 204 | ס 220 | ע 236 | פ 252 |
| D | ץ 141 | כ 157 | ל 173 | מ 189 | נ 205 | ס 221 | ע 237 | פ 253 |
| E | ץ 142 | כ 158 | ל 174 | מ 190 | נ 206 | ס 222 | ע 238 | פ 254 |
| F | ץ 143 | כ 159 | ל 175 | מ 191 | נ 207 | ס 223 | ע 239 | פ 255 |

Character code table Page 10 (PC737: Greek):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | Α 128 | Ρ 144 | Ι 160 | ⋮ 176 | Λ 192 | ⋮ 208 | Ω 224 | Ν 240 |
| 1 | Β 129 | Σ 145 | Κ 161 | ⋮ 177 | ⊥ 193 | ⋮ 209 | α 225 | ± 241 |
| 2 | Γ 130 | Τ 146 | λ 162 | ⋮ 178 | Τ 194 | ⋮ 210 | ε 226 | ≥ 242 |
| 3 | Δ 131 | Υ 147 | μ 163 | ⋮ 179 | ⊥ 195 | ⋮ 211 | η 227 | ≤ 243 |
| 4 | Ε 132 | Φ 148 | ν 164 | ⋮ 180 | ⋮ 196 | ⋮ 212 | ι 228 | Υ 244 |
| 5 | Ζ 133 | Χ 149 | Ξ 165 | ⋮ 181 | ⊥ 197 | ⋮ 213 | ί 229 | ϕ 245 |
| 6 | Η 134 | Ψ 150 | ο 166 | ⋮ 182 | ⋮ 198 | ⋮ 214 | ό 230 | ÷ 246 |
| 7 | Θ 135 | Ω 151 | π 167 | ⋮ 183 | ⋮ 199 | ⋮ 215 | ύ 231 | = 247 |
| 8 | Ι 136 | α 152 | ρ 168 | ⋮ 184 | ⋮ 200 | ⋮ 216 | ü 232 | ° 248 |
| 9 | Κ 137 | β 153 | σ 169 | ⋮ 185 | ⋮ 201 | ⋮ 217 | ώ 233 | • 249 |
| A | Λ 138 | γ 154 | ς 170 | ⋮ 186 | ⋮ 202 | ⋮ 218 | Α 234 | · 250 |
| B | Μ 139 | δ 155 | τ 171 | ⋮ 187 | ⋮ 203 | ⋮ 219 | Ε 235 | ✓ 251 |
| C | Ν 140 | ε 156 | υ 172 | ⋮ 188 | ⋮ 204 | ⋮ 220 | Η 236 | η 252 |
| D | Ξ 141 | ζ 157 | φ 173 | ⋮ 189 | ⋮ 205 | ⋮ 221 | Ι 237 | ² 253 |
| E | Ο 142 | η 158 | χ 174 | ⋮ 190 | ⋮ 206 | ⋮ 222 | Ό 238 | ■ 254 |
| F | Π 143 | θ 159 | ψ 175 | ⋮ 191 | ⋮ 207 | ⋮ 223 | Υ 239 | 255 |

Character code table Page 11 (PC874: Thai):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Character code table Page 12 (PC857: Turkish):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | Ç 128 | È 144 | â 160 | ̂ 176 | Ł 192 | ° 208 | Ó 224 | - 240 |
| 1 | Ü 129 | æ 145 | í 161 | ̂ 177 | Ł 193 | ª 209 | ß 225 | ± 241 |
| 2 | é 130 | Æ 146 | ó 162 | ̂ 178 | Ł 194 | Ê 210 | Ô 226 | 242 |
| 3 | â 131 | ô 147 | û 163 | ı 179 | Ł 195 | Ê 211 | Ô 227 | ¼ 243 |
| 4 | ä 132 | ö 148 | ñ 164 | ı 180 | - 196 | Ê 212 | Ö 228 | ½ 244 |
| 5 | à 133 | ò 149 | Ñ 165 | À 181 | † 197 | 213 | Ö 229 | ¾ 245 |
| 6 | ä 134 | Ü 150 | Ğ 166 | À 182 | ä 198 | İ 214 | µ 230 | + 246 |
| 7 | ç 135 | ü 151 | ğ 167 | À 183 | Ä 199 | İ 215 | 231 | 247 |
| 8 | ê 136 | ı 152 | ç 168 | © 184 | İ 200 | İ 216 | × 232 | ° 248 |
| 9 | ë 137 | ö 153 | © 169 | İ 185 | İ 201 | İ 217 | Ü 233 | 249 |
| A | è 138 | Ü 154 | ~ 170 | İ 186 | İ 202 | İ 218 | Ü 234 | · 250 |
| B | ÿ 139 | ø 155 | ½ 171 | İ 187 | İ 203 | İ 219 | Ü 235 | ¹ 251 |
| C | ı 140 | £ 156 | ¼ 172 | İ 188 | İ 204 | İ 220 | İ 236 | ³ 252 |
| D | ı 141 | Ø 157 | ı 173 | © 189 | = 205 | İ 221 | ÿ 237 | ² 253 |
| E | À 142 | Š 158 | « 174 | ¥ 190 | İ 206 | İ 222 | - 238 | ■ 254 |
| F | Á 143 | Š 159 | » 175 | ı 191 | İ 207 | İ 223 | · 239 | 255 |

Character code table Page 16 (WPC1254: Turkish):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | € 128 | | | ° 176 | À 192 | Ā 208 | à 224 | ō 240 |
| 1 | | ` 129 | ı 145 | ± 177 | Á 193 | Ñ 209 | á 225 | ñ 241 |
| 2 | | ´ 130 | ç 146 | ² 178 | Â 194 | Ô 210 | â 226 | ô 242 |
| 3 | ƒ 131 | " 147 | £ 163 | ³ 179 | Ã 195 | Ó 211 | ã 227 | ó 243 |
| 4 | ˆ 132 | " 148 | ¤ 164 | ´ 180 | Ä 196 | Ö 212 | ä 228 | ö 244 |
| 5 | ˜ 133 | · 149 | ¥ 165 | µ 181 | Å 197 | Ø 213 | å 229 | ø 245 |
| 6 | † 134 | - 150 | ı 166 | ¶ 182 | Æ 198 | Ö 214 | æ 230 | ö 246 |
| 7 | ‡ 135 | - 151 | § 167 | · 183 | Ç 199 | × 215 | ç 231 | ÷ 247 |
| 8 | ^ 136 | ~ 152 | ¨ 168 | ˘ 184 | È 200 | Ø 216 | è 232 | ø 248 |
| 9 | ‰ 137 | ™ 153 | © 169 | ¹ 185 | É 201 | Ù 217 | é 233 | ù 249 |
| A | Š 138 | š 154 | ª 170 | º 186 | Ê 202 | Ú 218 | ê 234 | û 250 |
| B | < 139 | > 155 | « 171 | » 187 | Ë 203 | Û 219 | ë 235 | ü 251 |
| C | ƒ 140 | æ 156 | ¬ 172 | ¼ 188 | Ì 204 | Ü 220 | ì 236 | ü 252 |
| D | | | - 173 | ½ 189 | Í 205 | İ 221 | í 237 | ı 253 |
| E | | | ® 174 | ¾ 190 | Î 206 | Ş 222 | î 238 | ş 254 |
| F | | ÿ 159 | - 175 | ¿ 191 | Ï 207 | ß 223 | ÿ 239 | ÿ 255 |

Character code table Page 17 (WPC1250: Central Europe):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | € 128 | | | ° 176 | Ř 192 | Đ 208 | ŕ 224 | đ 240 |
| 1 | | ‘ 129 | ’ 145 | ± 177 | Á 193 | Ñ 209 | á 225 | ñ 241 |
| 2 | | ‘ 130 | ’ 146 | | À 194 | Ň 210 | à 226 | ň 242 |
| 3 | | “ 131 | ” 147 | ‡ 179 | Ā 195 | Ó 211 | ā 227 | ó 243 |
| 4 | | ” 132 | ” 148 | ˆ 180 | Ä 196 | Ô 212 | ä 228 | ô 244 |
| 5 | | ˆ 133 | ˆ 149 | Α 165 | Ł 197 | Õ 213 | í 229 | ó 245 |
| 6 | † 134 | ˆ 150 | ı 166 | ¶ 182 | Ć 198 | Ö 214 | ć 230 | ö 246 |
| 7 | ‡ 135 | ˆ 151 | ß 167 | ˆ 183 | Č 199 | × 215 | č 231 | ˆ 247 |
| 8 | | | ˆ 152 | ˆ 168 | Č 200 | Ř 216 | č 232 | ř 248 |
| 9 | ‰ 137 | ˆ 153 | Ø 169 | ā 185 | É 201 | Û 217 | é 233 | û 249 |
| A | š 138 | š 154 | Š 170 | š 186 | Ê 202 | Ü 218 | ê 234 | ü 250 |
| B | < 139 | > 155 | « 171 | » 187 | Ë 203 | Ů 219 | ë 235 | ů 251 |
| C | š 140 | š 156 | ˆ 172 | Ĺ 188 | Ê 204 | Ü 220 | ë 236 | ü 252 |
| D | † 141 | † 157 | ˆ 173 | ˆ 189 | † 205 | Ý 221 | † 237 | ý 253 |
| E | ž 142 | ž 158 | Ž 174 | ž 190 | † 206 | † 222 | † 238 | † 254 |
| F | ž 143 | ž 159 | ž 175 | ž 191 | Đ 207 | ß 223 | đ 239 | ˆ 255 |

Character code table Page 18 (WPC28591: Latin 1):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|-----|-----|-------|-------|-------|-------|-------|-------|
| 0 | 128 | 144 | 160 | 176 | À 192 | Ð 208 | à 224 | ð 240 |
| 1 | 129 | 145 | ì 161 | ± 177 | Á 193 | Ñ 209 | á 225 | ñ 241 |
| 2 | 130 | 146 | ¢ 162 | ² 178 | Â 194 | Ò 210 | â 226 | ò 242 |
| 3 | 131 | 147 | £ 163 | ³ 179 | Ã 195 | Ó 211 | ã 227 | ó 243 |
| 4 | 132 | 148 | ¤ 164 | ´ 180 | Ä 196 | Ô 212 | ä 228 | ô 244 |
| 5 | 133 | 149 | ¥ 165 | µ 181 | Å 197 | Ö 213 | å 229 | ö 245 |
| 6 | 134 | 150 | ¦ 166 | ¶ 182 | Æ 198 | Ø 214 | æ 230 | ø 246 |
| 7 | 135 | 151 | § 167 | · 183 | Ç 199 | × 215 | ç 231 | ÷ 247 |
| 8 | 136 | 152 | ¨ 168 | ¸ 184 | È 200 | Ø 216 | è 232 | ø 248 |
| 9 | 137 | 153 | © 169 | ¹ 185 | É 201 | Ù 217 | é 233 | ù 249 |
| A | 138 | 154 | ª 170 | º 186 | Ê 202 | Ú 218 | ê 234 | ú 250 |
| B | 139 | 155 | « 171 | » 187 | Ë 203 | Û 219 | ë 235 | û 251 |
| C | 140 | 156 | ¬ 172 | ¼ 188 | Ì 204 | Ü 220 | ì 236 | ü 252 |
| D | 141 | 157 | ­ 173 | ½ 189 | Í 205 | Ý 221 | í 237 | ý 253 |
| E | 142 | 158 | ® 174 | ¾ 190 | Î 206 | Þ 222 | î 238 | þ 254 |
| F | 143 | 159 | ¯ 175 | ¿ 191 | Ï 207 | ß 223 | ï 239 | ÿ 255 |

Character code table Page 19 (WPC28592: Latin 2):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|-----|-----|-----|-----|---|---|---|---|
| 0 | 128 | 144 | 160 | 176 | Ř | Ď | ř | ď |
| 1 | 129 | 145 | Å | å | Ä | Ñ | á | ñ |
| 2 | 130 | 146 | ˆ | ˜ | À | Ñ | â | ñ |
| 3 | 131 | 147 | Ł | ł | Å | Ó | ä | ó |
| 4 | 132 | 148 | Π | ˘ | Ä | Ô | ä | ô |
| 5 | 133 | 149 | Ĺ | ĺ | Ĺ | Õ | í | õ |
| 6 | 134 | 150 | Š | š | Č | Ö | č | ö |
| 7 | 135 | 151 | Š | ˙ | Č | × | č | ˙ |
| 8 | 136 | 152 | ˆ | ˜ | Č | Ř | č | ř |
| 9 | 137 | 153 | Š | š | É | Û | é | û |
| A | 138 | 154 | Š | š | É | Û | é | û |
| B | 139 | 155 | † | † | É | Û | ë | ü |
| C | 140 | 156 | ž | ž | É | Û | ë | ü |
| D | 141 | 157 | ˆ | ˜ | ı | Ÿ | ı | Ÿ |
| E | 142 | 158 | ž | ž | ı | ı | ı | ı |
| F | 143 | 159 | ž | ž | Ö | B | đ | ˙ |

Character code table Page 20 (WPC28599: Turkish):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Character code table Page 21 (WPC28605: Latin 9):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Character code table Page 22 (PC864: Arabic):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|-----------|----------|-----------|----------|----------|
| 0 | ° 128 | β 144 | | • 176 | Φ 192 | ذ 208 | ـ 224 | |
| 1 | · 129 | ∞ 145 | — 161 | \\ 177 | • 193 | ز 209 | ف 225 | |
| 2 | • 130 | Φ 146 | ل 162 | ٢ 178 | ٢ 194 | ز 210 | ق 226 | ن 242 |
| 3 | √ 131 | ± 147 | £ 163 | ٣ 179 | ا 195 | س 211 | ك 227 | • 243 |
| 4 | ⌘ 132 | ½ 148 | ¤ 164 | £ 180 | ف 196 | ث 212 | ج 228 | ف 244 |
| 5 | — 133 | ¼ 149 | ل 165 | • 181 | ع 197 | م 213 | م 229 | ف 245 |
| 6 | 134 | ≈ 150 | | ٦ 182 | ن 198 | ف 214 | ن 230 | ف 246 |
| 7 | † 135 | « 151 | | ٧ 183 | ا 199 | ط 215 | م 231 | ف 247 |
| 8 | ‡ 136 | » 152 | ل 168 | ٨ 184 | ج 200 | ظ 216 | و 232 | ق 248 |
| 9 | ‡ 137 | ٥ 153 | ب 169 | ٩ 185 | ة 201 | ع 217 | ق 233 | ق 249 |
| A | ‡ 138 | ٥ 154 | ت 170 | ف 186 | ت 202 | غ 218 | ج 234 | ل 250 |
| B | ‡ 139 | | ث 171 | ا 187 | ت 203 | ا 219 | ض 235 | ل 251 |
| C | ‡ 140 | | • 172 | س 188 | ج 204 | هـ 220 | م 236 | ك 252 |
| D | ‡ 141 | ٧ 157 | ع 173 | ث 189 | ح 205 | ÷ 221 | ف 237 | ف 253 |
| E | ‡ 142 | ٧ 158 | ع 174 | ص 190 | خ 206 | × 222 | غ 238 | ■ 254 |
| F | ‡ 143 | | غ 175 | ف 191 | د 207 | ع 223 | م 239 | |

Character code table Page 23 (PC720: Arabic):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 128 | 144 | ١٦٠ | ١٧٦ | ١٩٢ | ٢٠٨ | ٢٢٤ | ٢٤٠ |
| 1 | 129 | 145 | ١٦١ | ١٧٧ | ١٩٣ | ٢٠٩ | ٢٢٥ | ٢٤١ |
| 2 | ١٣٠ | ١٤٦ | ١٦٢ | ١٧٨ | ١٩٤ | ٢١٠ | ٢٢٦ | ٢٤٢ |
| 3 | ١٣١ | ١٤٧ | ١٦٣ | ١٧٩ | ١٩٥ | ٢١١ | ٢٢٧ | ٢٤٣ |
| 4 | ١٣٢ | ١٤٨ | ١٦٤ | ١٨٠ | ١٩٦ | ٢١٢ | ٢٢٨ | ٢٤٤ |
| 5 | ١٣٣ | ١٤٩ | ١٦٥ | ١٨١ | ١٩٧ | ٢١٣ | ٢٢٩ | ٢٤٥ |
| 6 | ١٣٤ | ١٥٠ | ١٦٦ | ١٨٢ | ١٩٨ | ٢١٤ | ٢٣٠ | ٢٤٦ |
| 7 | ١٣٥ | ١٥١ | ١٦٧ | ١٨٣ | ١٩٩ | ٢١٥ | ٢٣١ | ٢٤٧ |
| 8 | ١٣٦ | ١٥٢ | ١٦٨ | ١٨٤ | ٢٠٠ | ٢١٦ | ٢٣٢ | ٢٤٨ |
| 9 | ١٣٧ | ١٥٣ | ١٦٩ | ١٨٥ | ٢٠١ | ٢١٧ | ٢٣٣ | ٢٤٩ |
| A | ١٣٨ | ١٥٤ | ١٧٠ | ١٨٦ | ٢٠٢ | ٢١٨ | ٢٣٤ | ٢٥٠ |
| B | ١٣٩ | ١٥٥ | ١٧١ | ١٨٧ | ٢٠٣ | ٢١٩ | ٢٣٥ | ٢٥١ |
| C | ١٤٠ | ١٥٦ | ١٧٢ | ١٨٨ | ٢٠٤ | ٢٢٠ | ٢٣٦ | ٢٥٢ |
| D | ١٤١ | ١٥٧ | ١٧٣ | ١٨٩ | ٢٠٥ | ٢٢١ | ٢٣٧ | ٢٥٣ |
| E | ١٤٢ | ١٥٨ | ١٧٤ | ١٩٠ | ٢٠٦ | ٢٢٢ | ٢٣٨ | ٢٥٤ |
| F | ١٤٣ | ١٥٩ | ١٧٥ | ١٩١ | ٢٠٧ | ٢٢٣ | ٢٣٩ | ٢٥٥ |

Character code table Page 24 (WPC1256: Arabic):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | ع 128 | س 144 | ل 160 | و 176 | ز 192 | ح 208 | ا 224 | |
| 1 | ي 129 | ك 145 | م 161 | ن 177 | ج 193 | د 209 | ر 225 | |
| 2 | ب 130 | ف 146 | ط 162 | ق 178 | ي 194 | ز 210 | ح 226 | |
| 3 | ف 131 | ك 147 | ل 163 | و 179 | ز 195 | ح 211 | ا 227 | |
| 4 | ب 132 | ف 148 | ط 164 | ق 180 | ي 196 | ز 212 | ح 228 | و 244 |
| 5 | ب 133 | ف 149 | ط 165 | ق 181 | ي 197 | ز 213 | ح 229 | و 245 |
| 6 | ب 134 | ف 150 | ط 166 | ق 182 | ي 198 | ز 214 | ح 230 | و 246 |
| 7 | ب 135 | ف 151 | ط 167 | ق 183 | ي 199 | ز 215 | ح 231 | و 247 |
| 8 | ب 136 | ف 152 | ط 168 | ق 184 | ي 200 | ز 216 | ح 232 | و 248 |
| 9 | ب 137 | ف 153 | ط 169 | ق 185 | ي 201 | ز 217 | ح 233 | و 249 |
| A | ب 138 | ف 154 | ط 170 | ق 186 | ي 202 | ز 218 | ح 234 | و 250 |
| B | ب 139 | ف 155 | ط 171 | ق 187 | ي 203 | ز 219 | ح 235 | و 251 |
| C | ب 140 | ف 156 | ط 172 | ق 188 | ي 204 | ز 220 | ح 236 | و 252 |
| D | ب 141 | ف 157 | ط 173 | ق 189 | ي 205 | ز 221 | ح 237 | و 253 |
| E | ب 142 | ف 158 | ط 174 | ق 190 | ي 206 | ز 222 | ح 238 | و 254 |
| F | ب 143 | ف 159 | ط 175 | ق 191 | ي 207 | ز 223 | ح 239 | و 255 |

Character code table Page 25 (WPC28596: Arabic):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Character code table Page 26 (KATAKANA: Asia):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | 128 ㇰ | 144 ㇱ | 160 ㇲ | 176 ㇳ | 192 ㇴ | 208 ㇵ | 224 ㇶ | 240 ㇷ |
| 1 | 129 ㇸ | 145 ㇹ | 161 ㇺ | 177 ㇻ | 193 ㇼ | 209 ㇽ | 225 ㇾ | 241 ㇿ |
| 2 | 130 ㇰ | 146 ㇱ | 162 ㇲ | 178 ㇳ | 194 ㇴ | 210 ㇵ | 226 ㇶ | 242 ㇷ |
| 3 | 131 ㇸ | 147 ㇹ | 163 ㇺ | 179 ㇻ | 195 ㇼ | 211 ㇽ | 227 ㇾ | 243 ㇿ |
| 4 | 132 ㇰ | 148 ㇱ | 164 ㇲ | 180 ㇳ | 196 ㇴ | 212 ㇵ | 228 ㇶ | 244 ㇷ |
| 5 | 133 ㇸ | 149 ㇹ | 165 ㇺ | 181 ㇻ | 197 ㇼ | 213 ㇽ | 229 ㇾ | 245 ㇿ |
| 6 | 134 ㇰ | 150 ㇱ | 166 ㇲ | 182 ㇳ | 198 ㇴ | 214 ㇵ | 230 ㇶ | 246 ㇷ |
| 7 | 135 ㇸ | 151 ㇹ | 167 ㇺ | 183 ㇻ | 199 ㇼ | 215 ㇽ | 231 ㇾ | 247 ㇿ |
| 8 | 136 ㇰ | 152 ㇱ | 168 ㇲ | 184 ㇳ | 200 ㇴ | 216 ㇵ | 232 ㇶ | 248 ㇷ |
| 9 | 137 ㇸ | 153 ㇹ | 169 ㇺ | 185 ㇻ | 201 ㇼ | 217 ㇽ | 233 ㇾ | 249 ㇿ |
| A | 138 ㇰ | 154 ㇱ | 170 ㇲ | 186 ㇳ | 202 ㇴ | 218 ㇵ | 234 ㇶ | 250 ㇷ |
| B | 139 ㇸ | 155 ㇹ | 171 ㇺ | 187 ㇻ | 203 ㇼ | 219 ㇽ | 235 ㇾ | 251 ㇿ |
| C | 140 ㇰ | 156 ㇱ | 172 ㇲ | 188 ㇳ | 204 ㇴ | 220 ㇵ | 236 ㇶ | 252 ㇷ |
| D | 141 ㇸ | 157 ㇹ | 173 ㇺ | 189 ㇻ | 205 ㇼ | 221 ㇽ | 237 ㇾ | 253 ㇿ |
| E | 142 ㇰ | 158 ㇱ | 174 ㇲ | 190 ㇳ | 206 ㇴ | 222 ㇵ | 238 ㇶ | 254 ㇷ |
| F | 143 ㇸ | 159 ㇹ | 175 ㇺ | 191 ㇻ | 207 ㇼ | 223 ㇽ | 239 ㇾ | 255 ㇿ |

Character code table Page 27 (PC775: Baltic):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | Č 128 | Ē 144 | Ā 160 | Š 176 | Ļ 192 | ā 208 | Ō 224 | - 240 |
| 1 | Ū 129 | Ē 145 | Ī 161 | Š 177 | Ļ 193 | č 209 | Ē 225 | ± 241 |
| 2 | é 130 | Ē 146 | ó 162 | Š 178 | Ļ 194 | ē 210 | Ō 226 | " 242 |
| 3 | ā 131 | ō 147 | ž 163 | ī 179 | Ļ 195 | ē 211 | N 227 | ¼ 243 |
| 4 | ā 132 | ō 148 | ž 164 | ī 180 | - 196 | ī 212 | Ō 228 | Ņ 244 |
| 5 | ó 133 | G 149 | ž 165 | A 181 | Ļ 197 | š 213 | Ō 229 | Š 245 |
| 6 | ā 134 | φ 150 | " 166 | č 182 | U 198 | U 214 | μ 230 | ÷ 246 |
| 7 | č 135 | š 151 | ī 167 | E 183 | Ū 199 | Ū 215 | Ņ 231 | ¿ 247 |
| 8 | ī 136 | š 152 | č 168 | E 184 | š 200 | ž 216 | K 232 | ° 248 |
| 9 | ē 137 | ō 153 | č 169 | ī 185 | Ū 201 | Ķ 217 | k 233 | • 249 |
| A | R 138 | Ū 154 | - 170 | ī 186 | š 202 | Ķ 218 | L 234 | · 250 |
| B | Ķ 139 | ø 155 | ¼ 171 | ī 187 | Ū 203 | ■ 219 | l 235 | ¹ 251 |
| C | Ķ 140 | ē 156 | ¼ 172 | ī 188 | Ū 204 | ■ 220 | n 236 | ³ 252 |
| D | ž 141 | ø 157 | Ķ 173 | ī 189 | = 205 | ■ 221 | E 237 | ² 253 |
| E | Ā 142 | × 158 | « 174 | š 190 | Ķ 206 | ■ 222 | N 238 | ■ 254 |
| F | Ā 143 | × 159 | » 175 | ī 191 | ž 207 | ■ 223 | ' 239 | ² 255 |

Character code table Page 28 (WPC1257: Baltic):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|----------|----------|----------|----------|----------|----------|----------|----------|
| 0 | € 128 | | | ° 176 | À 192 | Š 208 | à 224 | š 240 |
| 1 | | ' 129 | | ± 177 | Į 193 | Ų 209 | į 225 | ų 241 |
| 2 | | ˆ 130 | č 146 | ž 178 | Ą 194 | Ņ 210 | č 226 | ņ 242 |
| 3 | | “ 131 | £ 147 | ³ 179 | Č 195 | Ó 211 | č 227 | ó 243 |
| 4 | | ” 132 | ¤ 148 | ´ 180 | Ā 196 | Ō 212 | ā 228 | ō 244 |
| 5 | | ˙ 133 | | μ 181 | Ā 197 | Ō 213 | ā 229 | ō 245 |
| 6 | † 134 | ˘ 150 | ı 166 | Ų 182 | Ē 198 | Ö 214 | ē 230 | ö 246 |
| 7 | ‡ 135 | ˚ 151 | š 167 | ˙ 183 | Ē 199 | × 215 | ē 231 | ˚ 247 |
| 8 | | | Ø 168 | ø 184 | Č 200 | U 216 | č 232 | u 248 |
| 9 | ‰ 137 | ™ 153 | © 169 | ı 185 | É 201 | Ł 217 | é 233 | ł 249 |
| A | | | Ŗ 170 | ŗ 186 | Ž 202 | Š 218 | ž 234 | š 250 |
| B | < 139 | > 155 | « 171 | » 187 | Ē 203 | Ū 219 | ē 235 | ū 251 |
| C | | | ˆ 172 | ¼ 188 | Ġ 204 | Ü 220 | ġ 236 | ü 252 |
| D | ˆ 141 | ˆ 157 | ˆ 173 | ½ 189 | Ķ 205 | Ž 221 | ķ 237 | ž 253 |
| E | ˆ 142 | ˆ 158 | ˆ 174 | ¾ 190 | Ī 206 | Ž 222 | ī 238 | ž 254 |
| F | | | Æ 175 | æ 191 | Ļ 207 | Ķ 223 | ļ 239 | ˆ 255 |

Character code table Page 29 (WPC28594: Baltic):

| HEX | 8 | 9 | A | B | C | D | E | F |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Asia Code Pages – Definition for USB Loader

Character Set Structure

This Structure is divided into two blocks. The first block is the header from loader. At offset 64 begins the second block with character set data. At the end, 20 character-tables (See Code Table Structure) can be defined, with the range from the first character to the last. The table must start from the end of the offset – member + the offset.

| Offset | Field | Size | Description |
|--------|-----------------|------|--|
| 0 | Identifier | 5 | Module identifier ('\$MOD\$') |
| 5 | Separator | 1 | Blank (0x20) |
| 6 | Date | 6 | Release date with the format 'YYMMDD' (‘020301’ for 1.03.02) |
| 12 | Separator | 1 | Blank (0x20) |
| 13 | Version | 4 | Release and release version ('0105' for V01.05) |
| 17 | Separator | 1 | Blank (0x20) |
| 18 | Name | 8 | Module name (e.g. 'TH230__') |
| 26 | Separator | 1 | Dot ('.') |
| 27 | Extension | 3 | Extension ('FNE' for standard code pages) |
| 30 | Separator | 1 | String terminator (0x00) |
| 31 | Length | 3 | Module data length |
| 34 | Checksum | 4 | 32-bit checksum |
| 38 | Reserved | 26 | Reserved |
| 64 | Name | 16 | Name of this Character Set |
| 80 | Separator | 1 | String terminator (0x00) |
| 81 | TypeID | 1 | Character Set Type ID (= 1 Thermo) |
| 82 | CodeTableNumber | 2 | Number of entries in Code Table Array |
| 84 | Type | 1 | 0 for Asia |
| 85 | Subtype | 1 | Type of Asia-Font: <ul style="list-style-type: none"> • 0 – initial • 1 – JIS • 2 – Chinese • 3 – Korean • 4 – THAI |

| 86 | <i>Control</i> | 2 | 16-Bit Control-Field for special Settings: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---------------------------|---------------------------------|--|--|-----|-------------|--|-----|---|----------------------------|--|---|-----------------|--|---|-----------------|--|---|-----------------|--|--|--|-------------------|-------------------|-------------------|---|---------------------------------|-----------------|---|-----------------|-----------------|---|-----------------|-----------------|---|-----------------|-----------------|---|-----------------|-----------------|---|-----------------|-----------------|----|-----------------|-----------------|----|-----------------|-----------------|----|-----------------|-----------------|----|-----------------|-----------------|----|-----------------|-----------------|----|-----------------|-----------------|
| <table border="1"> <thead> <tr> <th></th><th>Bit</th><th colspan="2">Description</th></tr> </thead> <tbody> <tr> <td rowspan="4">All</td><td>0</td><td colspan="2">No user defined characters</td></tr> <tr> <td>1</td><td colspan="2"><i>Reserved</i></td></tr> <tr> <td>2</td><td colspan="2"><i>Reserved</i></td></tr> <tr> <td>3</td><td colspan="2"><i>Reserved</i></td></tr> <tr> <td colspan="2"></td><th>Subtype = 1 (JIS)</th><th>Subtype = 0,2,3,4</th></tr> <tr> <td rowspan="12">Subtype exclusive</td><td>4</td><td>JIS-SHIFTJIS-Conversion allowed</td><td><i>Reserved</i></td></tr> <tr> <td>5</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> <tr> <td>6</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> <tr> <td>7</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> <tr> <td>8</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> <tr> <td>9</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> <tr> <td>10</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> <tr> <td>11</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> <tr> <td>12</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> <tr> <td>13</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> <tr> <td>14</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> <tr> <td>15</td><td><i>Reserved</i></td><td><i>Reserved</i></td></tr> </tbody> </table> | | | | | Bit | Description | | All | 0 | No user defined characters | | 1 | <i>Reserved</i> | | 2 | <i>Reserved</i> | | 3 | <i>Reserved</i> | | | | Subtype = 1 (JIS) | Subtype = 0,2,3,4 | Subtype exclusive | 4 | JIS-SHIFTJIS-Conversion allowed | <i>Reserved</i> | 5 | <i>Reserved</i> | <i>Reserved</i> | 6 | <i>Reserved</i> | <i>Reserved</i> | 7 | <i>Reserved</i> | <i>Reserved</i> | 8 | <i>Reserved</i> | <i>Reserved</i> | 9 | <i>Reserved</i> | <i>Reserved</i> | 10 | <i>Reserved</i> | <i>Reserved</i> | 11 | <i>Reserved</i> | <i>Reserved</i> | 12 | <i>Reserved</i> | <i>Reserved</i> | 13 | <i>Reserved</i> | <i>Reserved</i> | 14 | <i>Reserved</i> | <i>Reserved</i> | 15 | <i>Reserved</i> | <i>Reserved</i> |
| | Bit | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| All | 0 | No user defined characters | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2 | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3 | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Subtype = 1 (JIS) | Subtype = 0,2,3,4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Subtype exclusive | 4 | JIS-SHIFTJIS-Conversion allowed | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 5 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 6 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 7 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 8 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 9 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 10 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 11 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 12 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 13 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 14 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 15 | <i>Reserved</i> | <i>Reserved</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 88 | <i>CodeTableArray[20]</i> | 20*8 | Code table array | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <i>FirstCode</i> | 2 | 2 – Bytes for the first character in table | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <i>LastCode</i> | 2 | 2 – Bytes for the last character in table | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <i>OffsetFont</i> | 4 | Offset to Code Table Structure | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Code Table Structure

| <i>Offset</i> | <i>Field</i> | <i>Size</i> | <i>Description</i> |
|---------------|------------------------|-------------|-------------------------------|
| 0 | <i>CharacterWidth</i> | 1 | Width of character in pixels |
| 1 | <i>CharacterHeight</i> | 1 | Height of character in pixels |
| 2 | <i>Reserved</i> | 2 | Reserved |
| 4 | <i>Offset</i> | 4 | Offset to character image |

USB Interface

The Universal Serial Bus (USB) is a peripheral bus for personal computers that was first released in January 1996.

The **TH230** supports the USB Printer Class.

USB Descriptors

When plugging in an USB device the USB enumeration process starts and the device reports their attributes using descriptors. A descriptor is a data structure with a defined format.

Device Descriptor

A device descriptor describes general information about an USB device. It includes information that applies globally to the device and all of the device's configurations. An USB device has only one device descriptor.

| <i>Offset</i> | <i>Field</i> | <i>Size</i> | <i>Value</i> | <i>Description</i> |
|---------------|--------------------------|-------------|--------------|--|
| 0 | <i>bLength</i> | 1 | 12h | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 01h | DEVICE descriptor type |
| 2 | <i>bcdUSB</i> | 2 | 0200h | USB specification release number in binary coded decimal (2.0) |
| 4 | <i>bDeviceClass</i> | 1 | 00h | Class code |
| 5 | <i>bDeviceSubClass</i> | 1 | 00h | Subclass code |
| 6 | <i>bDeviceProtocol</i> | 1 | 00h | Protocol code |
| 7 | <i>bMaxPacketSize0</i> | 1 | 08h | Maximum packet size for endpoint zero |
| 8 | <i>idVendor</i> | 2 | 0AA7h | WN Vendor ID |
| 10 | <i>idProduct</i> | 2 | 0304h | Product ID |
| 12 | <i>bcdDevice</i> | 2 | XXh | Device release number in binary coded decimal |
| 14 | <i>iManufacturer</i> | 1 | Index | Index of string descriptor (<i>see 1.1.1</i>) |
| 15 | <i>iProduct</i> | 1 | Index | Index of string descriptor (<i>see 1.1.1</i>) |
| 16 | <i>iSerialNumber</i> | 1 | 00h | Index of string descriptor (<i>see 1.1.1</i>) |
| 17 | <i>bNumConfiguration</i> | 1 | 01h | Number of configurations |

Configuration Descriptor

The configuration descriptor describes information about a specific device configuration. The descriptor contains a *bConfigurationValue* field with a value that, when used as a parameter to the SetConfiguration() request, causes the device to assume the described configuration.

A USB device has one or more configuration descriptors. Each configuration has one or more interfaces and each interface has zero or more endpoints.

The whole configuration is transmitted in the following order:

- Configuration Descriptor
 - Interface 0 Descriptor (Printer)
 - Endpoint 1-2 Descriptors
 - Interface 1 Descriptor (DFUX)
 - DFUX Functional Descriptor

| Offset | Field | Size | Value | Description |
|--------|----------------------------|------|-------|--|
| 0 | <i>bLength</i> | 1 | 09h | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 02h | CONFIGURATION descriptor type |
| 2 | <i>wTotalLength</i> | 2 | XXh | Size of complete configuration descriptors (configuration, interface, endpoint, class- or vendor-specific) in bytes |
| 4 | <i>bNumInterfaces</i> | 1 | 02h | Number of interfaces supported by this config. |
| 5 | <i>bConfigurationValue</i> | 1 | 01h | Configuration value (for SET_CONFIGURATION) |
| 6 | <i>iConfiguration</i> | 1 | 00h | Index of string descriptor (not used) |
| 7 | <i>bmAttributes</i> | 1 | E0h | Configuration characteristics <ul style="list-style-type: none"> Bit 7: Reserved (set to one) Bit 6: Self-powered Bit 5: Remote Wakup Bit 4..0: Reserved (reset to zero) |
| 8 | <i>bMaxPower</i> | 1 | 00h | Maximum power consumption from the bus |

Interface Descriptors

The interface descriptor describes a specific interface provided by the associated configuration. A configuration provides one or more interfaces, each with its own endpoint descriptors describing a unique set of endpoints within the configuration. An interface descriptor is always returned as part of a configuration descriptor. It cannot be accessed directly with a Get or Set Descriptor request.

An interface may include alternate settings that allow the endpoints and/or their characteristics to be varied after the device has been configured. The default setting for an interface is always alternate setting zero.

The **TH230** printer provides two interfaces: the Firmware Upgrade interface (DFUX) and the Printer interface. A multi-interface device is called composite device.

Interface 0 Descriptor (Printer)

This interface is used as printer class interface for transferring data to and from the device. From the systems point of view this interface stands for the printer device so the used printer class driver will be bind to this interface.

| Offset | Field | Size | Value | Description |
|---------------|---------------------------|-------------|--------------|--|
| 0 | <i>bLength</i> | 1 | 09h | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 04h | INTERFACE descriptor type |
| 2 | <i>bInterfaceNumber</i> | 1 | 00h | Number of this interface |
| 3 | <i>bAlternateSetting</i> | 1 | 00h | Alternate setting. Must be zero |
| 4 | <i>bNumEndpoints</i> | 1 | 02h | Number of used endpoint (except EP0) |
| 5 | <i>bInterfaceClass</i> | 1 | 07h | Base class for printers |
| 6 | <i>bInterfaceSubClass</i> | 1 | 01h | Subclass code for printer devices |
| 7 | <i>bInterfaceProtocol</i> | 1 | 02h | Bi-directional printer interface |
| 8 | <i>iInterface</i> | 1 | Index | Index of string descriptor (see 1.1.1) |

Interface 1 Descriptor (DFUX)

Endpoint Descriptors

Each endpoint used for an interface has its own descriptor. This descriptor contains the information required by the host to determine the bandwidth requirements of each endpoint. An endpoint descriptor is always returned as part of a configuration descriptor. It cannot be accessed directly with a Get or Set Descriptor request. There is never an endpoint descriptor for endpoint zero.

Endpoint 1 Descriptor (Interface 0)

This endpoint is used for transferring data from host to printer device.

| Offset | Field | Size | Value | Description |
|--------|-------------------------|------|-------|---|
| 0 | <i>bLength</i> | 1 | 07h | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 05h | ENDPOINT descriptor type |
| 2 | <i>bEndpointAddress</i> | 1 | 81h | Endpoint address (IN) Bit 7 0 = OUT, 1 = IN Bit 4..6 Reserved, must be 0 Bit 0..3 Endpoint number |
| 3 | <i>bmAttributes</i> | 1 | 02h | BULK endpoint |
| 4 | <i>wMaxPacketSize</i> | 2 | 40h | Maximum data transfer size |
| 6 | <i>bInterval</i> | 1 | 00h | Does not apply to Bulk endpoints |

Endpoint 2 Descriptor (Interface 0)

This endpoint is used for transferring data from printer device to host.

| Offset | Field | Size | Value | Description |
|--------|-------------------------|------|-------|--|
| 0 | <i>bLength</i> | 1 | 07h | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 05h | ENDPOINT descriptor type |
| 2 | <i>bEndpointAddress</i> | 1 | 02h | Endpoint address (OUT) Bit 7 0 = OUT, 1 = IN Bit 4..6 Reserved, must be 0 Bit 0..3 Endpoint number |
| 3 | <i>bmAttributes</i> | 1 | 02h | BULK endpoint |
| 4 | <i>wMaxPacketSize</i> | 2 | 40h | Maximum data transfer size |
| 6 | <i>bInterval</i> | 1 | 00h | Does not apply to Bulk endpoints |

String Descriptors

Descriptors contain references to string descriptors that provide displayable information describing a descriptor in human-readable form. The inclusion of string descriptors is optional. If a device does not support string descriptors, all references to string descriptors within device, configuration, and interface descriptors must be reset to zero.

The strings in a USB device may support multiple languages. When requesting a string descriptor, the requester specifies the desired language using a sixteen bit language ID (LANGID).

LangID

| Offset | Field | Size | Value | Description |
|---------------|------------------------|-------------|--------------|-----------------------------------|
| 0 | <i>bLength</i> | 1 | 04h | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 03h | STRING descriptor type |
| 2 | <i>bString</i> | 2 | 0409h | standard US ASCII characters |

Manufacture String

| Offset | Field | Size | Value | Description |
|---------------|------------------------|-------------|--------------|-----------------------------------|
| 0 | <i>bLength</i> | 1 | 1Eh | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 03h | STRING descriptor type |
| 2 | <i>bString</i> | 1Ch | Unicode | “Wincor Nixdorf” |

Product String

| Offset | Field | Size | Value | Description |
|---------------|------------------------|-------------|--------------|-----------------------------------|
| 0 | <i>bLength</i> | 1 | 0Ch | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 03h | STRING descriptor type |
| 2 | <i>bString</i> | 0Ah | Unicode | “TH230” |

DFUX Interface String

Printer Interface String

| Offset | Field | Size | Value | Description |
|---------------|------------------------|-------------|--------------|-----------------------------------|
| 0 | <i>bLength</i> | 1 | 24h | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 03h | STRING descriptor type |
| 2 | <i>bString</i> | 22h | Unicode | "Printer Interface" |

Following string descriptors are not published in the devices descriptor set (-> "hidden" strings

SerialNumber String (index 80h)

| Offset | Field | Size | Value | Description |
|---------------|------------------------|-------------|--------------|-----------------------------------|
| 0 | <i>bLength</i> | 1 | 12h | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 03h | STRING descriptor type |
| 2 | <i>bString</i> | 10h | Unicode | Serial Number |

WN Device Configuration String (index 81h)

| Offset | Field | Size | Value | Description |
|---------------|------------------------|-------------|--------------|-----------------------------------|
| 0 | <i>bLength</i> | 1 | 28h | Size of this descriptor, in bytes |
| 1 | <i>bDescriptorType</i> | 1 | 03h | STRING descriptor type |
| 2 | <i>bString</i> | 26h | Unicode | "Printer:TH230:0304:" |

Printer Interface

The **TH230** printers are multi-interface-devices (composite device) and one of these interfaces is the printer interface. Every interface is a logical device from the host point of view and the printer interface is the printer in fact.

IEEE 1284 Device ID (GET_DEVICE_ID)

Upon receive of the printer class-specific request GET_DEVICE_ID the printer returns a device ID string that is compatible with IEEE 1284. See IEEE 1284 for syntax and formatting information.

Device ID string:

"MFG: Wincor Nixdorf; CMD: ESC/POS; MDL: TH230;"

SOFT_RESET

This class-specific request clears all printer buffers and resets the printer interface to their default states. This request does not change the USB addressing or USB configuration – in other words there is none new USB enumeration.

USB Reset

On receipt of an USB reset all printer buffers are cleared and a new USB enumeration is started.

USB Detach/Attach

When the printer is detached from USB the current printer receive buffer content will be proceed on.

On attaching the printer to the USB all printer buffers will be cleared (like SOFT_RESET).

Receipt Buffer

While printer is in online state following hysteresis levels are valid:

| | Size 4096 Bytes | | Size 45 Bytes | |
|--------|----------------------------|----------------------------|----------------------------|----------------------------|
| | USB NAK (fill level >=) | USB ACK (fill level <=) | USB NAK (fill level >=) | USB ACK (fill level <=) |
| TH230 | 4096 | 3072 | 45 | 40 |
| TH230+ | 3968 | 3072 | 27 | 9 |

If the printer is in offline state and the receipt buffer is full the behavior depends on the memory switch 2-8 Listen to Real-Time-Commands (see command GS (E)).

RS232 Interface

Specifications

| | |
|--------------------|---|
| Data transmission: | Serial |
| Synchronization: | Asynchronous |
| Handshaking: | DTR/DSR or XON/XOFF control |
| Signal levels: | MARK = -3 to -15 V: Logic "1" / OFF SPACE = +3 to +15 V: Logic "0" / ON |
| Baud rate: | 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps (bps: bits per second) |
| Data word length: | 8 bits |
| Stop bits: | 1 bit |
| Parity settings | none, even or odd |

For default settings and changing those please refer to GS (E pL pH fn a d1...dk <Function 11> (page 114).

Handshake control

In DTR/DSR mode the RTS line is switch parallel to DTR to be conform to older cable variants!

Receiving data

- DTR/RTS MARK
- between power on and ready to accept data
 - in an error state
 - remaining space in data buffer falls below off-hysteresis

- XOFF sent
- in an error state
 - remaining space in data buffer falls below off-hysteresis

- DTR/RTS SPACE,
XON sent
- when ready to accept data
 - remaining space in data buffer rises above on-hysteresis

Sending data

In DTR/DSR mode, data is sent only when DSR is SPACE.

In XON/XOFF mode, DSR is ignored.

Receipt Buffer

Following hysteresis levels are valid:

| Size 4096 Bytes | | Size 45 Bytes | |
|----------------------------------|---------------------------------|----------------------------------|---------------------------------|
| Handshake Off (fill level >=) | Handshake On (fill level <=) | Handshake Off (fill level >=) | Handshake On (fill level <=) |
| 3968 | 3072 | 27 | 9 |

Ethernet Interface

Overview

Ethernet is a family of frame-based computer networking technologies for local area networks (LANs) to connect multiple computers and devices. It is standardized as **IEEE 802.3**.

Features

| | |
|-----------|---|
| Speed | 10/100 MBit Full/Half Duplex |
| Protocols | IP, TCP, UDP, ICMP, DHCP, DNS, DDNS, ARP, BOOTP, HTTP, Telnet, SNMP, DynDNS |
| Connector | RJ-45 |

Handshake control

Due to technical limitations there is none data flow control (handshake). Therefore the application must ensure, that the printer receipt data buffer does not overflow (see page 247 (0) for receipt buffer size)!

Only with “Printer Legacy Support” enabled, a receipt data buffer overflow will be prevented, but with the disadvantage, that real-time commands will not work in offline mode!

Receipt Buffer

See page 247(0) for receipt buffer size.

Service Menu

A service menu is integrated in the TH230 printer, which allows the user to easily configure the printer, run several diagnostic tests and gain some information about the printer state and the built-in functionality.

This chapter gives an overview about the handling and the content of the service menu.

Menu handling

Selecting the service menu

To start the service menu you just have to press and hold the linefeed (LF) button during power up or printer reset.

The service menu splits up in two parts:

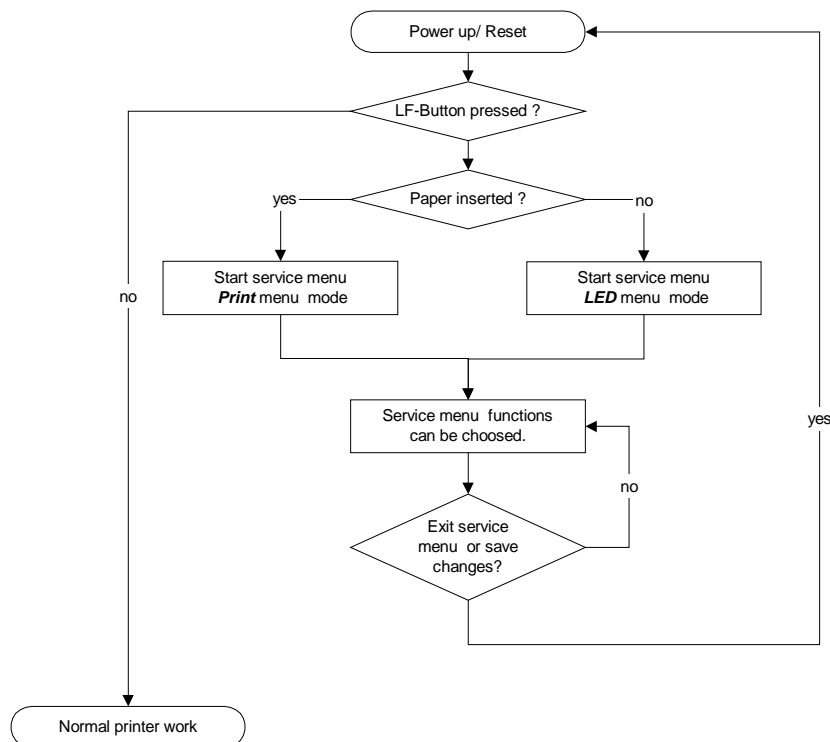
LED Service Menu see page 248

Print Service Menu see page 249

If there is no paper inserted in the printer there are only some major functions, which do not require paper, available via the LED driven menu.

With paper inserted, the Print-menu will be printed out and all of the functionality of the service menu is available.

The flowchart below shows the process to reach the service mode menu.



Controlling the service menu

The linefeed button (LF) controls the service menu. A short click of the LF button increments the selection and a long click (approx. 1 sec) executes the selected function or rather prints out the selected sub-menu.

| Action | Effect |
|--------------------------------|--|
| Short click | Increment selection |
| Long click (approx. 1 sec.) | Execute selected function / Confirm |

The current selection is indicated by the 3 LED's.

| Function | LED code |
|---------------|--|
| | ● LED on / ● LED off ○ LED flashing |
| Please select | ● ● ● |
| 1 | ● ● ● |
| 2 | ● ● ● |
| 3 | ● ● ● |
| 4 | ● ● ● |
| 5 | ● ● ● |
| 6 | ● ● ● |
| 7 | ● ● ● |
| 8 | ● ● ● |
| 9 | ● ● ● |
| 10 | ● ● ● |

For example if you wish to choose the function with the number 3, you have to click the LF button 3 times and then confirm the selection with a long click.

If the print menu is active, the current menu or sub-menu will also be printed.

Note: In case of paper end, cover open or error during printing, the service menu will be finished and an automatic reset is forced. All changed settings will be lost.

Save changed settings

In the configurations menu it is possible to change some Memory switches or customer values. If one or more changes are done, the user will ask for save this new setting. It is possible to ignore the save request and continue the settings. However, every “Exit/Save” command or additional change will ask again. It is the fastest procedure to continue the settings and save **all** changes at one time, because every saved setting needs a warm reboot. After the save command, all new values are stored in EEPROM and the printer will perform a warm reboot.

IMPORTANT: All new settings must be saved before these settings are used. The status print of actual settings and self-test print will show the settings are stored in EEPROM. If a value is changed by the user it will be marked with a ‘*’ behind the setting.

LED Service Menu

If there is **no paper** inside the printer, the service menu will be represented by a LED driven menu, which allows only some major functions. The hierarchy is flat, which means there are no sub-menus.

To get access to the full service menu please insert some paper in the printer.

| Function | LED code | Description |
|---------------|--|-----------------------|
| | ● LED on / ● LED off ● LED flashing | |
| Please select | ● ● ● | |
| 1 | ● ● ● | Reset printer |
| 2 | ● ● ● | Run sensor test |
| 3 | ● ● ● | Set EEPROM to default |

Reset Printer

This function performs a warm reboot of the printer.

Run sensor test

This function shows the sensor changes. If at least one sensor status is changing, the green and red LED toggles.

The Sensor test can be stopped by pushing the Linefeed button once for a long time (> 1 second). Afterwards a software reset is executed.

Set EEPROM to default

In this menu, the default values for the memory switches and user configuration can be set. You must confirm this request (fast flashing Error LED) by a long click (approx. 1 sec). Afterwards the printer performs a warm reboot.

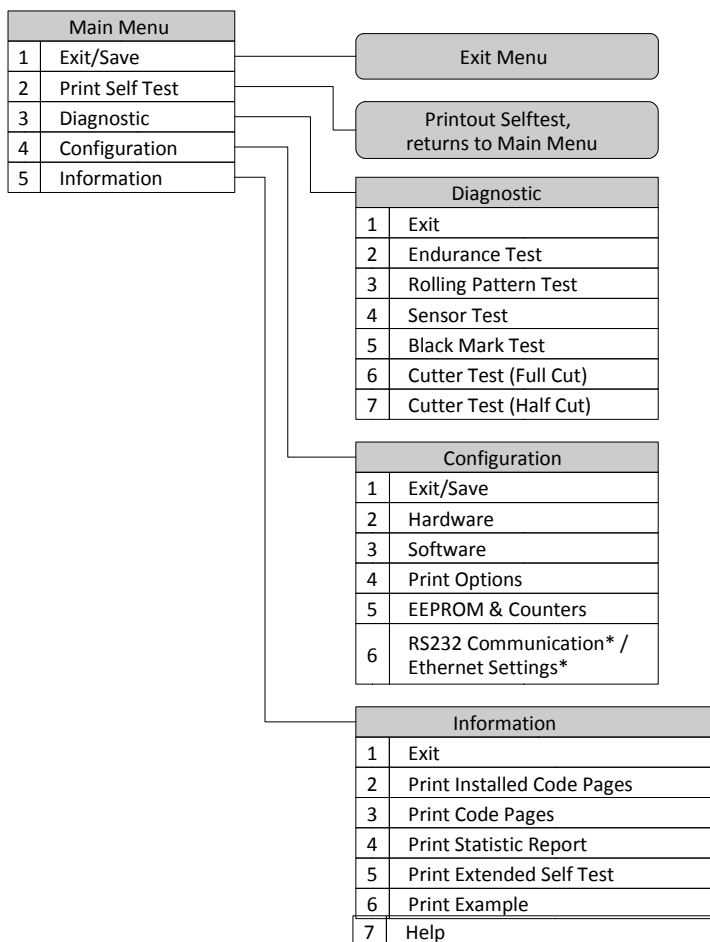
The statistic data and stored printer information’s are unchanged.

Print Service Menu

The print menu allows you to change the most important printer settings and gives you access to all diagnostic and information functions. Unlike the LED menu, the print menu expands over several menus with sub-menus. The current menu level is printed out.

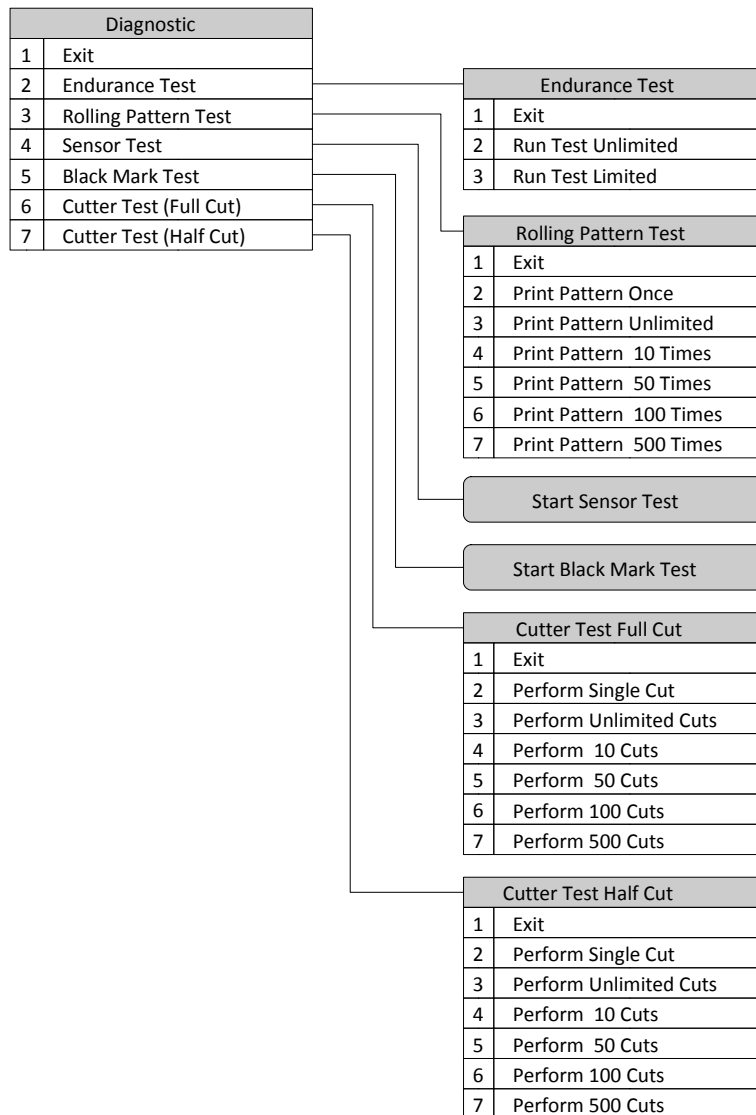
Below a detailed description of the overall structure and the functions of the service menu is shown.

Service Menu Structure – Main Menu

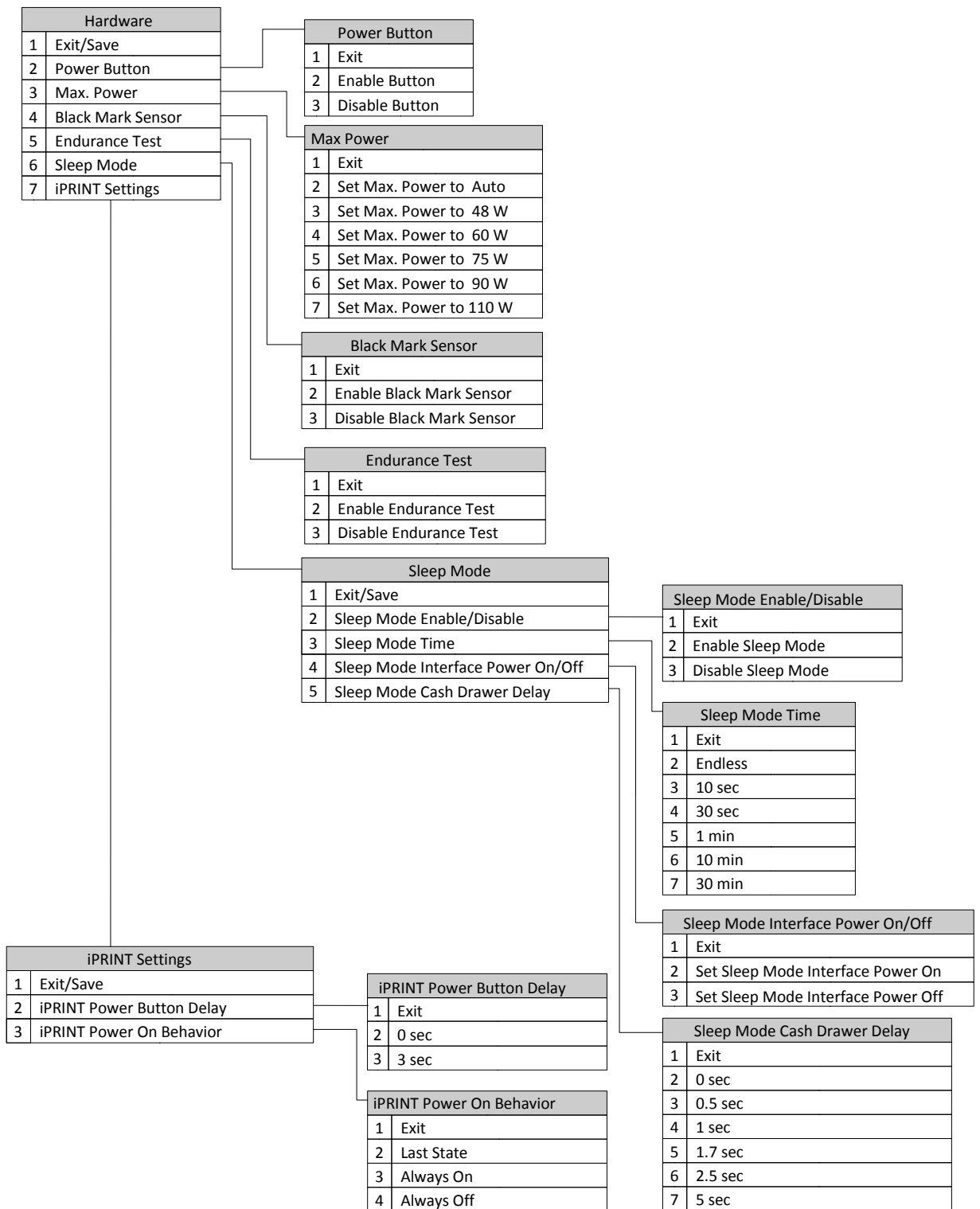


* depends on used interface card

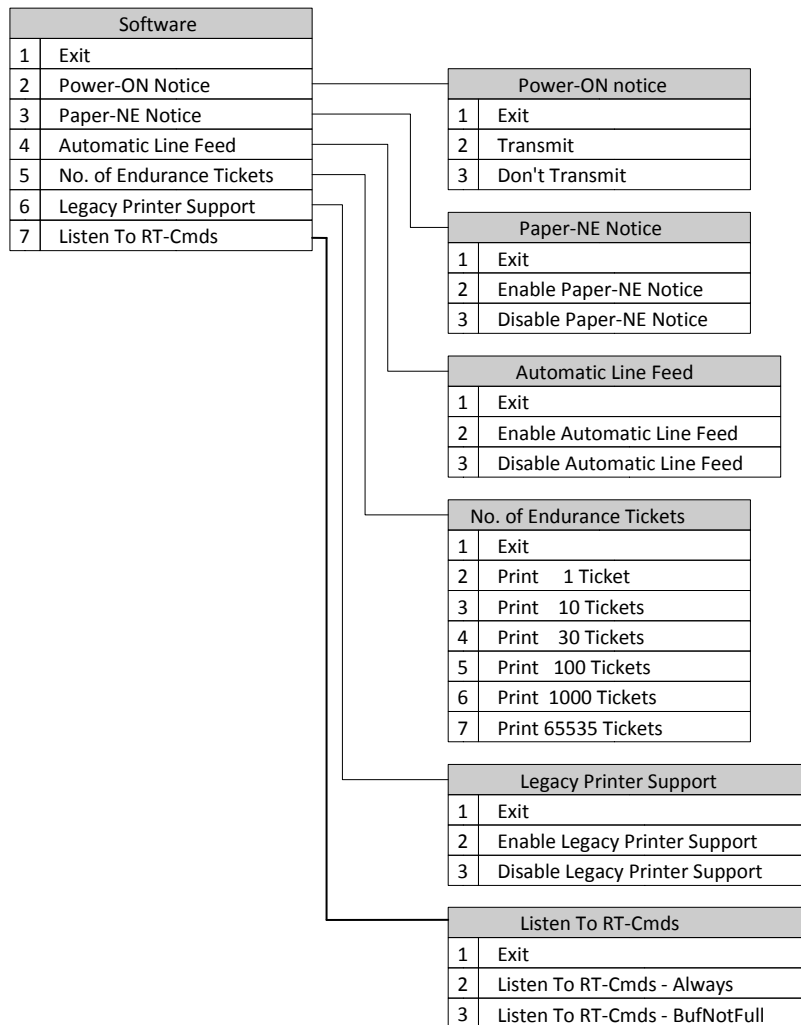
Main Menu / Diagnostic

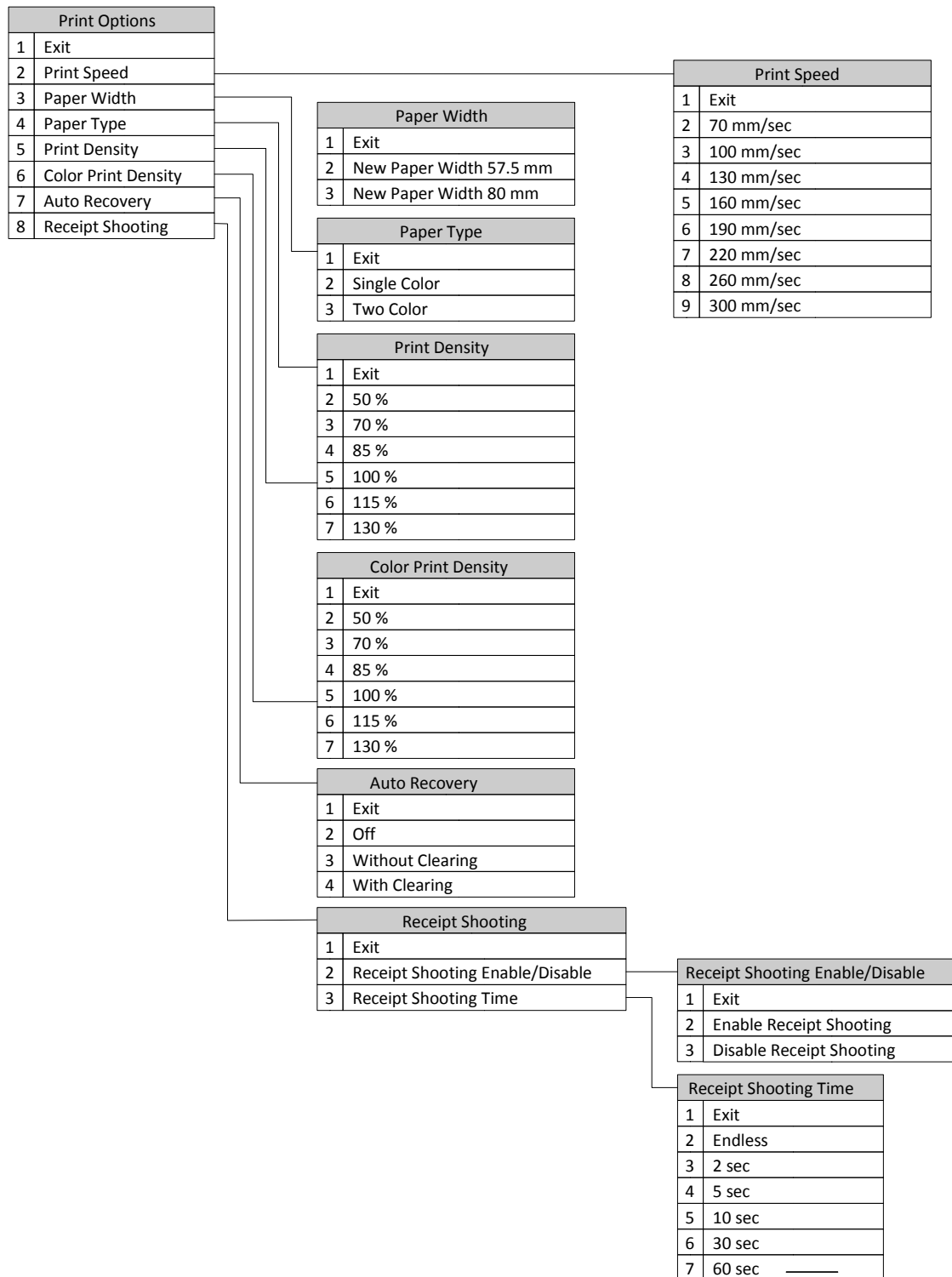


Main Menu / Configuration / Hardware



Main Menu / Configuration / Software

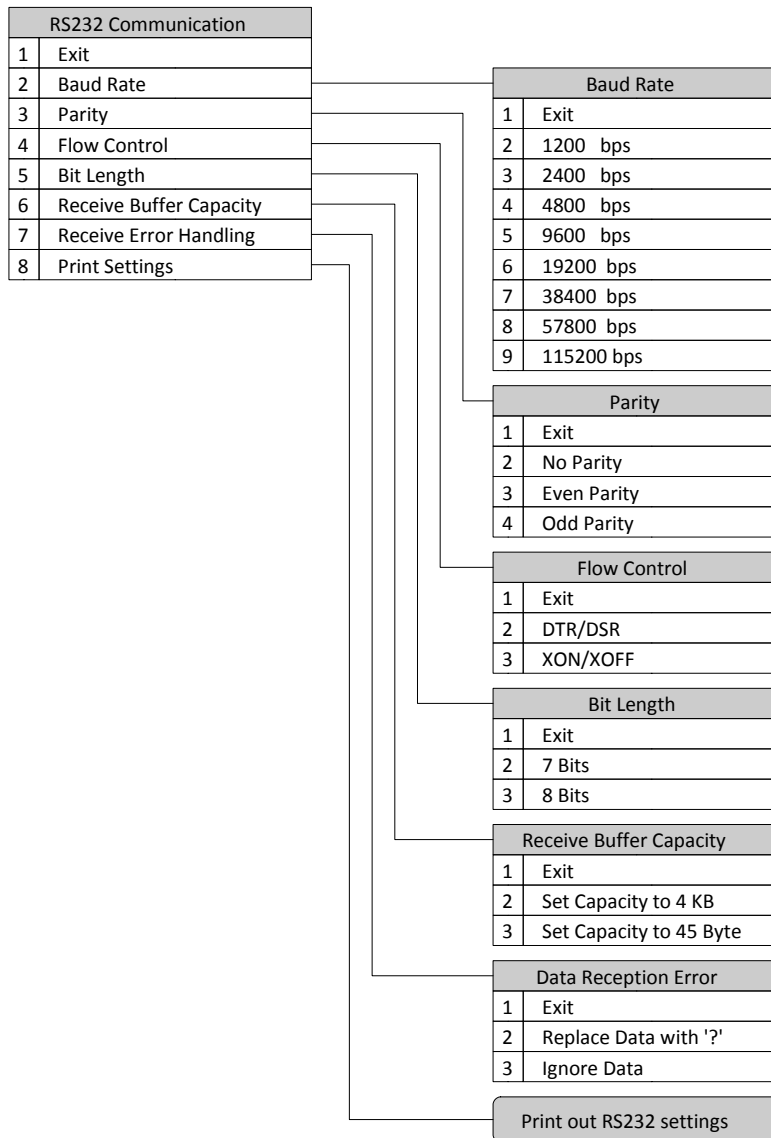


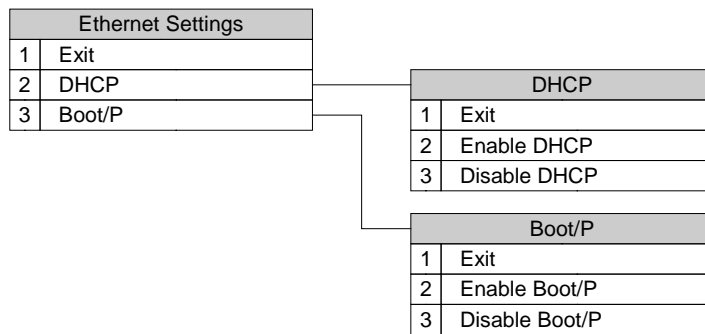
Main Menu / Configuration / Print Options

Main Menu / Configuration / EEPROM & Counters

| EEPROM & Counters | |
|-------------------|-----------------------|
| 1 | Exit |
| 2 | Set EEPROM to Default |

Main Menu / Configuration / RS232 Communication



Main Menu / Configuration / Ethernet Settings

Exit

This command leaves the service menu. If there are changes of one or more unsaved settings, the user will be asked for saving. After that, the printer will perform a warm reboot.

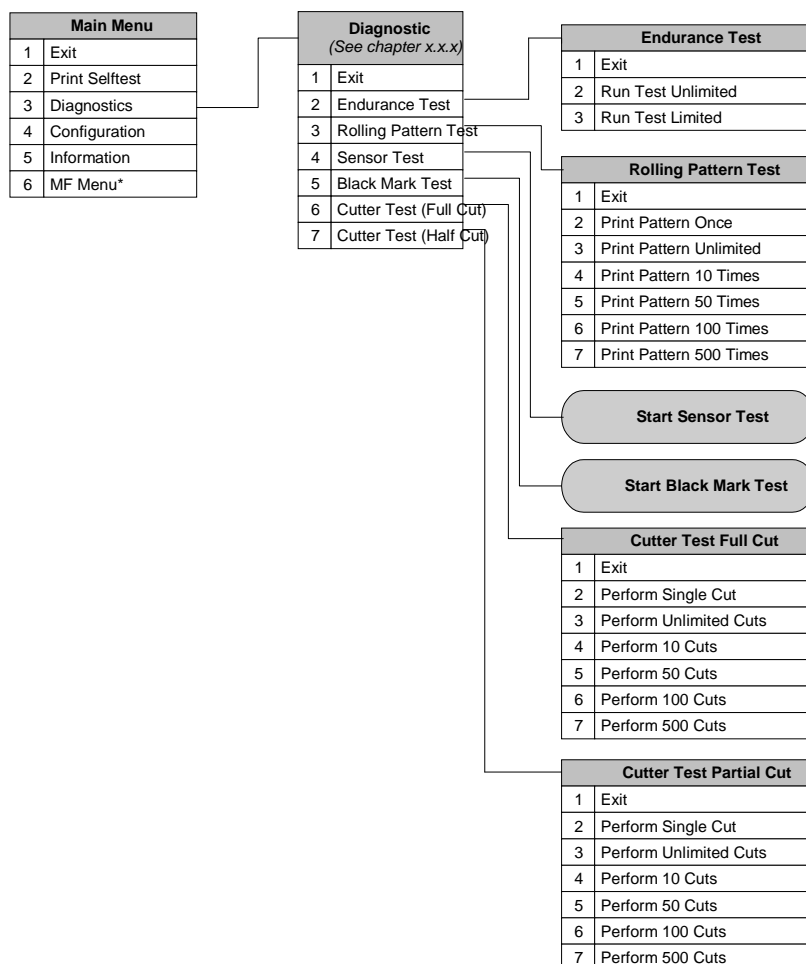
Print Selftest

By using this command the printer performs a self test printout. It is the same function like started by the “(US) t” sequence or in iPRINT when closing the cover while pressing the Linefeed button. A detailed description how statistical information is saved can be found on page 278.

In case of paper out during printing, the printer performs an automatic reset.

Diagnostic - Menu

The diagnostic menu gives you the ability to do some basic diagnostic. You can print out some endurance or rolling pattern tickets. You also can perform a sensor, a cutter and a black mark test.



Every diagnostic function will be explained in the table below.

| Menu Nr. | Description | Available Options |
|----------|---|--|
| 3.1 | Exit/Save | |
| 3.2 | Endurance Test This menu gives the ability to start the endurance test with several conditions. At first it is possible to start the endurance test limited, which means the test will be performed as many times as defined by the Customized Value "Number of Endurance Tickets". In endless mode, the execution can be interrupted by a long click of the LF button. | Run endless or limited (Nr. of Endurance Tickets) Software ➡ <i>Number of Endurance tickets</i> |
| 3.3 | Rolling Pattern Test The rolling pattern menu allows you to print out a rolling pattern in numerous ways. You can print it out once, endless, which will be interrupted by a long click of the LF button, and a predefined number of times | 1, 10, 50, 100, 500, endless |
| 3.4 | Sensor Test This function shows the sensor changes (See page 273). The Sensor Test can be stopped by pushing the Linefeed button once for a long time (> 1 second). Afterwards a SW reset is executed. | |
| 3.5 | Black Mark Test In this menu the black mark test can be choose (see page 277). | |
| 3.6 | Cutter Test (Full Cut) The cutter test performs some cutter operations for a predefined number of times. In endless mode, the test will be interrupted by a long click of the LF button. For every cut there will be a notice on the generated ticket which gives information about the current number of cuts and the total number of cuts. | 1, 10, 50, 100, 500, endless mode |
| 3.7 | Cutter Test (Half Cut) This test is the same like the cutter test (full cut), but the printer performs a series of partial cuts. | 1, 10, 50, 100, 500, endless mode |

Configuration - Menu

In this menu section is it possible to change some printer parameter. It is very important to know what effects the change of a value. The procedure to save settings should be readed (see 0 Save changed settings – page 248) To leave this menu, choose “Exit/Save”.

Hardware

| Menu Nr. | Description | Available Options |
|----------|---|---|
| 4.2.1 | Exit/Save | |
| 4.2.2 | Power Button Select the function of the power button. If the power button is disabled, the printer can't shut off by the user. | Enable Button, Disable Button |
| 4.2.3 | Max. Power Select the maximum of power what the printer consume. | Auto, 48 W, 60 W, 75 W, 90 W, 110 W |
| 4.2.4 | Black Mark Sensor Select the usage of the black mark sensor. Be sure that there is black marked paper inside. Otherwise, a black mark error will occur. In this case is the only way to set all EEPROM Data to default by using the LED menu (see 0 Set EEPROM to default – page 248) | Enable Black Mark Sensor, Disable Black Mark Sensor |
| 4.2.5 | Endurance Test Select the start method for endurance test by using a USB or RS232 - short cut plug | Enable Endurance Test, Disable Endurance Test |
| 4.2.6 | Sleep Mode | |
| 4.2.6.2 | Sleep Mode Enable/Disable Enable or disable the Sleep Mode | Enable Sleep Mode, Disable Sleep Mode |
| 4.2.6.3 | Sleep Mode Time The minimum time to switch automatically in Sleep Mode | Endless, 10 sec, 30 sec, 1 min, 10 min, 30 min |
| 4.2.6.4 | Sleep Mode Interface Power On/Off The state on power for cash drawer and customer display during Sleep Mode | Set Sleep Mode Interface Power On, Set Sleep Mode Interface Power Off |

| | | |
|---------|--|---|
| 4.2.6.5 | Sleep Mode Cash Drawer Delay The minimum time between leaving Sleep Mode and opening cash drawer | 0 sec, 0.5 sec, 1 sec, 1.7 sec, 2.5 sec, 5 sec |
|---------|--|---|

Software

| Menu Nr. | Description | Available Options |
|----------|--|---|
| 4.3.1 | Exit Exit this menu level and give a save request, if there are unsaved changes. | |
| 4.3.2 | Power-ON Notice Select a power up notification on the communication interface | Transmit, Don't Transmit |
| 4.3.3 | Paper-NE Notice Select the usage of the Paper-Near-End Sensor. If Paper-NE notification is disabled, the printer doesn't transmit the PNE state by ASB or state request (ESC v) | Enable Paper-NE Notice, Disable Paper-NE Notice |
| 4.3.4 | Automatic Line Feed Generate a line feed after receiving <CR>. (see page 98 – GS (E fn3) | Enable Automatic Line Feed, Disable Automatic Line Feed |
| 4.3.5 | No. of Endurance Tickets Select the number of endurance tickets in for a limited endurance test. | Print 1 Ticket, Print 10 Tickets, Print 30 Tickets, Print 100 Tickets, Print 1.000 Tickets, Print 65.535 Tickets |
| 4.3.6 | Legacy Printer Support Enable this to fully support Windows printer support driver (e. g. Usbprint.sys). Following changes in the printer behaviour will be made: <ul style="list-style-type: none">- printer doesn't accept data while receive buffer is full (none data loss)- in case of USB interface a fixed (virtual) serial number is exposed to the host to avoid multiple printer installations | Enable Legacy Printer Support, Disable Legacy Printer Support |
| 4.3.7 | Listen To RT-Cmds Behavior of the printer regarding Real Time Commands. When set to always to printer listen always to Real Time Commands. When set to BufNotFull the printer listen only to Real Time Commands when the receive buffer is not full. | Listen To RT-Cmds – Always, Listen To RT-Cmds – BufNotFull |

Print Options

In this menu section is it possible to change some printer parameter. It is very important to know what effects a change of a value. The procedure to save settings should be read.

To leave this menu, choose "Exit/Save".

| Menu Nr. | Description | Available Options |
|----------|--|--|
| 4.4.1 | Exit Exit this menu level and give a save request, if there are unsaved changes. | |
| 4.4.2 | Print Speed Set the maximum of print speed for power consumption and print quality. | [70, 100, 130, 160, 190, 220] mm/sec |
| | Print Speed TH230+ Draft Set the maximum of print speed for power consumption and print quality. | [70, 100, 130, 160, 190, 220, 260, 300] mm/sec |
| 4.4.3 | Paper Width Set the used paper width. | New Paper Width 57.5 mm, New Paper Width 80 mm |
| 4.4.4 | Paper Type Set the used paper type. This value will be valid without a software reset. | Single Color, Two Color |
| 4.4.5 | Print Density Set the print density for different paper types. | 50%, 70%, 85%, 100%, 115%, 130% |
| 4.4.6 | Color Print Density Set the color print density for the second color if used a two color paper. | 50%, 70%, 85%, 100%, 115%, 130% |
| 4.4.7 | Auto Recovery Selects if and how the printer automatic recovers from an error. | Off, Without Clearing, With Clearing |
| 4.4.8 | Receipt Shooting Select the usage of the TH230 Receipt Shooting. | |
| 4.4.8.1 | Receipt Shooting Enable/Disable Enable or disable Receipt Shooting. | Enable Receipt Shooting, Disable Receipt Shooting |

| | | |
|---------|---|--|
| 4.4.8.2 | Receipt Shooting Time Defines the flush time for the Receipt Shooting memory. | Endless, 2 sec, 5 sec, 10 sec, 30 sec, 60 sec |
|---------|---|--|

EEPROM & Counters

| Menu Nr. | Description | Available Options |
|----------|--|-------------------|
| 4.5.1 | Exit Exit this menu level and give a save request, if there are unsaved changes. | |
| 4.5.2 | Set EEPROM to Default Sets the EEPROM values to (see 0 Set EEPROM to default – page 248) | |

RS232 Configuration

In this configuration menu, you can configure the parameters for use with one RS232 communications Interface. This interfaces boards are available with different options.

| Menu Nr. | Description | Available Options |
|----------|--|--|
| 4.6.1 | Exit Exit this menu level and gives a save request, if there are unsaved changes. | |
| 4.6.2 | Baud Rate Select the baud rate for serial communication. | [1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200] bps |
| 4.6.3 | Parity Select the data parity for serial communication. | No Parity, Even Parity, Odd Parity |
| 4.6.4 | Flow Control Select the flow control for serial communication. | DTR/DSR, ON/XOFF |
| 4.6.5 | Bit Length Select data bit length for serial communication. | 7 Bits, 8 Bits |
| 4.6.6 | Receive Buffer Capacity Select the receive buffer capacity (FIFO) | Set Capacity to 4 KB, Set Capacity to 45 Byte |
| 4.6.7 | Receive Error Handling Select how the printer will react to a receive error. | Replace Data with '?', Ignore Data |
| 4.6.8 | Print Settings Prints the actual (in EEPROM stored) settings for the serial communications interface (RS232) | |

Ethernet Configuration

In this configuration menu, you can configure the parameters for use with a Ethernet communication interface.

| Menu Nr. | Description | Available Options |
|----------|--|----------------------------------|
| 4.6.1 | Exit Exit this menu level and gives a save request, if there are unsaved changes. | |
| 4.6.2 | DHCP Enable the “Dynamic Host Configuration Protocol” to use a automatically assign of IP address and other configuration information. | Enable DHCP, Disable DHCP |
| 4.6.3 | Boot/P Enable the “Bootstrap Protocol” to obtain the IP address via this method. | Enable Boot/P, Disable Boot/P |

Information - Menu

In this menu is it possible to print out different information's about the TH230 printer.

| Menu Nr. | Description | Available Options |
|----------|---|-------------------|
| 6.1 | Exit Exit this menu level. | |
| 6.2 | Print Installed Code Pages That prints a printout with printer data and an overview of installed codepages. | |
| 6.3 | Print Code Pages That prints a collection of printouts of all chars of installed codepages. | |
| 6.4 | Print Statistic Report That prints a printout with printer data and statistic data. | |
| 6.5 | Print Extended Self Test That prints the extended self test with all printer data. | |
| 6.7 | Print Example That prints a small demo printout with capabilities of the TH230. | |
| 6.5 | Help Prints a short instruction for use the service menu. | |

MF Menu

The content of the MF menu varies from country to country. Please see the chapter MF Service menu in your localized TH230 MF manual.

TH230 Diagnostic Functions

| Diagnostic Function | Description | Selection |
|---------------------|---|--|
| Selftest | Printout printer info, settings and statistic data. | <ul style="list-style-type: none"> • Entering diagnostic mode • ESC – Command |
| Sensor test | Allow to test sensor functions. | <ul style="list-style-type: none"> • Diagnostic mode menu • LED diagnostic menu |
| EEPROM to default | Set some settings in EEPROM to default. | <ul style="list-style-type: none"> • Diagnostic mode menu • LED diagnostic menu |
| Endurance Test | Produce endless or a fixed count of test prints. | <ul style="list-style-type: none"> • Diagnostic mode menu • Short cut the USB interface or RS232 interface |
| Black Mark Test | Test the function of black mark control. | <ul style="list-style-type: none"> • Diagnostic mode menu |

Additional there is a hidden Reset button.

Selftest Printout

With the TH230 it is possible to print some self tests and printer information. The following table gives an overview about the printout versions.

| Menu Nr. | Short self test | Extended self test | Statistic report | Installed codepages |
|--|---|---|------------------|---------------------|
| Availability | service menu 2. / Control sequence "ust" | service menu 6.5 / Control sequence "GS (A 2 0 0 2" | service menu 6.4 | service menu 6.2 |
| Hardware information's | X | X | X | X |
| RS232 settings | (X)* | (X)* | | |
| Ethernet settings | (X)* | (X)* | | |
| Software modules | X | X | | |
| Asia Font | (X) | (X) | | |
| Printer settings | X | X | | |
| Sleep Mode | (X) | (X) | | |
| Sensor information's | X** | X** | | |
| Measured values | X | X | | |
| Installed codepages | | X | | X |
| Statistic report | | X | X | |
| Pixel test | X | X | | |
| Piezo test | X | X | | |
| Debug Info | (X)*** | (X)*** | (X)*** | (X)*** |

Remarks:

- (X)* - available only with selected interface board
- (X)** - advanced information's available only if black mark sensor enabled
- (X)*** - available only in debug firmware releases

Example of the Extended Selftest form:

**TH230+
Extended
Self Test**

Hardware Information:
 Manufacturer : WINCOR-NIXDORF
 Serial Number : 000000001
 Manufactured Board: D
 Production Date : 24-OCT-2011
 Interface ID : 90
 Interface Board : USB (Full-Speed)
 RS232
 Cash Drawer

RS232 Settings:
 Parameter : 19200 - 8N1
 Handshake : DTR/DSR
 Receive Buffer : large (4 kB)
 Receive Error : ignore

Software Modules:
 Firmware : 01.05
 Booter : 01.00
 Loader : 01.02
 Status : Verified
 Power Up Test : 01.00
 Checksum : OK
 Character Font : StdCodePages
 Font Version : 01.03

Printer Settings:
 Black Mark Sensor : disabled
 Endurance Test : disabled
 Automatic LF : enabled
 Power Button : enabled
 Power-ON Notice : disabled
 Paper-NE Notice : enabled
 Receipt Shooting : disabled
 Shoot Flush Time : endless
 Sleep Mode : disabled
 Max. Power : 110 W
 Max. Speed : 220 mm/sec
 Endurance Tickets : 500
 Paper Width : 80 mm
 Print Density : 100 %
 Paper Type : single color
 Code-128 ChkDigit : enabled
 ITF Leading Zero : enabled
 Brc String Term : enabled
 Leg. Printer Supp. : disabled
 Listen to RT-Cmds : always
 Default Code Page : 0
 Autorecovery : off
 Orig.-Controller : yes

Sensor Information:
 Sensor Plug Detection :
 Black Mark Sensor : available

Measured Values:
 Supply Voltage : 24.6 V
 Printhead Temp : 31.2 °C


Installed Code Pages:

| | | |
|----|---|----------|
| 0 | : | PC437 |
| 1 | : | PC850 |
| 2 | : | PC852 |
| 3 | : | PC860 |
| 4 | : | PC853 |
| 5 | : | PC865 |
| 6 | : | PC858 |
| 7 | : | PC866 |
| 8 | : | WPC1252 |
| 9 | : | PC862 |
| 10 | : | PC737 |
| 11 | : | PC874 |
| 12 | : | PC857 |
| 16 | : | WPC1254 |
| 17 | : | WPC1250 |
| 18 | : | WPC28591 |
| 19 | : | WPC28592 |
| 20 | : | WPC28599 |
| 21 | : | WPC28605 |
| 22 | : | PC864 |
| 23 | : | PC720 |
| 24 | : | WPC1256 |
| 25 | : | WPC28596 |
| 26 | : | KATAKANA |
| 27 | : | PC775 |
| 28 | : | WPC1257 |
| 29 | : | WPC28594 |

Statistic Report:

| | | |
|-------------------|---|--------|
| Dots Total | : | 216e03 |
| Dots Actual | : | 216e03 |
| Printhead Changes | : | 0 |
| Linefeeds Total | : | 206 |
| Linefeeds Actual | : | 206 |
| Mechanic Changes | : | 0 |
| Cuts Total | : | 2 |
| Cuts Actual | : | 2 |
| Cutter Changes | : | 0 |
| Cutter Errors | : | 0 |
| Max. Head Temp. | : | 32 °C |
| Black Mark Error | : | 0 |
| Thermistor Error | : | 0 |
| Low Volt. Error | : | 0 |
| High Volt. Error | : | 0 |
| Cover Open | : | 0 |
| FW Starts | : | 3 |
| Power On (Hours) | : | 0 |
| EEPROM Updates | : | 5 |
| EEPROM Status | : | OK |

Pixel Test:



98765432123456789

*** completed ***

The self test starts with collecting the printer data. The short and the extended self test perform a simple Piezo test before the printout starts.

The self test printout contains the following information's (depending on model, version, etc.):

- Headline (centre, double width): "TH230" / "TH230+"
"Selftest"

Hardware Information's:

- Manufacturer: "WINCOR-NIXDORF"
- Printer Serial Number: "xxxxxxx"
- PCB Version(**TH230**): HW dependant (starting with 'A')
- Manufactured Board (**TH230+**): HW dependant (starting with 'A')
- PCB production date ...
- Interface ID: "nn"
- Interface board: "USB Full Speed"
and optional HW dependant description

RS232 Settings: (only available if a RS232 interface board is used)

- Parameter Baudrate - [Bit length][Parity][Stop bits]
- Handshake communication protocol
- Buffer size description
- Receive Error description

Ethernet Settings: (only available if a Ethernet interface board is used)

- MAC Addr. (fixed) XXXX-XXXX-XXXX
- DHCP enabled/disabled
- IP Address XXX.XXX.XXX
- Net Mask XXX.XXX.XXX
- Gateway XXX.XXX.XXX
- Boot/P enabled/disabled

Software Modules:

- Firmware version / sub version vv.rr
- Booter version and sub version vv.rr
- Loader version and sub version vv.rr
Status: "Verified" or "Unverified"
- Power Up Test and sub version vv.rr
Checksum Status
- Character Font: Name of Character Generator
Version "Version"

Asia Font: (only available if an Asia Character Set is installed)

- Asia Font: Name of Character Generator
Version "Version"
Checksum: Status

Printer Settings:

| | |
|----------------------------|---|
| • Black Mark Sensor: | enabled / disabled |
| • Endurance Test: | enabled / disabled |
| • Automatic linefeed: | enabled / disabled |
| • Power button: | enabled / disabled |
| • Power-ON Notice: | enabled / disabled |
| • Paper- NE Notice: | enabled / disabled |
| • Receipt Shooting: | enabled / disabled |
| • Shoot Flush Time: | timeout before start the receipt shooting [sec] |
| • Sleep Mode: | enabled / disabled |
| • Max. power: | value of max. Power |
| • Max. speed: | “xxx mm/sec” |
| • Nr. of endurance tickets | Number |
| • Paper width | “xx mm” |
| • Print density | value of density |
| • Paper type | single color / two color |
| • Code-128 ChkDigit | Check Digit in 128 Barcode - enabled/disabled |
| • ITF Leading Zero | Leading Zero in ITF Barcode - enabled/disabled |
| • Brc String Term | Barcode String Termination - enabled/disabled |
| • Legacy Printer Support | enabled / disabled |
| • Listen to RT-Cmds | Always / BufNotFull |
| • Default Code Page | 0 - 255 |
| • Auto Recovery | off / on |
| • Orig.-Controller | yes / no |

Sleep Mode: (optional)

| | |
|----------------------|--|
| • Waiting Time: | timeout before switch to Sleep Mode |
| • Interface Power: | power of cash drawer and display (only TH230+) |
| • Cash Drawer Delay: | time from interface power on to open cash drawer |

Color Settings: (optional)

| | |
|-----------------|------------------------------|
| • Color Density | value of color print density |
|-----------------|------------------------------|

*** TWO COLOR PRINT ***

Sensor Informations:

Sensor Plug Detection

| | |
|---------------------|-------------------|
| • Black Mark Sensor | Plugged/Unplugged |
|---------------------|-------------------|

Sensor Calibration

| | |
|------------------|------------------------------------|
| | (advanced information's) |
| • BM Sensor | Calibration Value - (Backup value) |
| • BM offset: | value of offset setting |
| • Mark Distance: | „x.x mm“ |

Measured Values:

- Supply Voltage: "xx.x V"
- Printhead Temperature: "xx.x °C"

Installed Codepages:

| | |
|----|-------------------|
| 0 | PC437 |
| 1 | PC850 |
| 2 | PC852 |
| 3 | PC860 |
| 4 | PC863 |
| 5 | PC865 |
| 6 | PC858 |
| 7 | PC866 |
| 8 | WPC1252 |
| 9 | PC862 |
| 10 | PC737 |
| 11 | PC874 |
| 12 | PC857 |
| 13 | — |
| 14 | — |
| 15 | — |
| 16 | WPC1254 |
| 17 | WPC1250 |
| 18 | WPC28591 |
| 19 | WPC28592 |
| 20 | WPC28599 |
| 21 | WPC28605 |
| 22 | PC864 |
| 23 | PC720 |
| 24 | WPC1256 |
| 25 | WPC28596 |
| 26 | KATAKANA |
| 27 | PC775 (Baltic) |
| 28 | WPC1257 (Baltic) |
| 29 | WPC28594 (Baltic) |

Statistic Report:

- Dots Total: total number of printed dots
- Dots Actual: number of printed dots with current print head
- Printhead Changes: number of changed print lines
- Linefeeds Total: total number of executed line feeds in 1/7.52 inch
- Linefeeds Actual: number of executed line feeds with current mechanism in 1/7.52 inch
- Mechanic Changes: number of changed line feed mechanism
- Cuts Total: total number of executed cuts
- Cuts Actual: number of executed cuts with current cutter unit
- Cutter Changes: number of changed cutter units
- Cutter Errors: Error counter for Cutter Errors (16 bit)
- Max. Head Temp.: Maximum head temperature in °C
- Black Mark Error: Error counter for Black Mark Errors (16 bit)
- Thermistor Error: Error counter for Thermistor Errors (16 bit)
- Low Voltage Error: Error counter for Low Voltage Errors (16 bit)
- High Voltage Error: Error counter for High Voltage Errors (16 bit)
- Cover Open: Counter for Cover Open (16 bit)
- Firmware starts: number of firmware start actions
- Power On (hours): hours of power on time
- EEPROM Updates: number of updates in E²PROM
- EEPROM Status: shows if E²PROM checksum is OK

Pixel Test:

- Printout of a graphics print pattern to check the print quality regarding missing dots. There are two different pixel tests dependant of paper width.



*** completed ***

Sensor Test

This function shows the sensor changes. If at least one sensor status is changing, the green and red LED toggles.

The sensor test can be stopped by pushing the linefeed button once for a long time (> 1 second). Afterwards a software reset is executed.

EEPROM default settings

Memory Switches

| | |
|-------------------------------|---------------------------|
| Black Mark Sensor | Disabled |
| Endurance Test | Disabled |
| Automatic Line Feed | Enabled |
| Power Button | Enabled |
| Power-ON Notice | Disabled |
| Paper-NE Notice | Enabled |
| Receipt Shooting | Disabled |
| Sleep Mode | Disabled / TH230+ enabled |
| Code 128 Check Digit | Enabled |
| ITF Leading Zero | Enabled |
| Barcode String Termination | Enabled |
| Legacy Printer Support | Disabled |
| Listen To RT-Cmds | Always |
| Interface Power in Sleep Mode | On |

Also the configuration settings are set to the following values:

Customized values

| | |
|-----------------------------|------------------|
| Print Density | 100% |
| Paper Width | Unchanged |
| Max Speed | 220 mm/s |
| Max Power | Auto |
| Paper Type | Single color |
| Number of Endurance Tickets | 500 |
| BM Adjustment Value | Unchanged |
| Color Print Density | 100% |
| Receipt Shooting Flush Time | Endless |

| | |
|-------------------------|-----------|
| Default Code Page | 0 (PC437) |
| Sleep Waiting Time | 1 min |
| Sleep Cash Drawer Delay | 1.7 sec |
| Default Code Page | 0 (PC437) |

RS232 Settings

| | |
|----------------|------------|
| Baud Rate | 19200 baud |
| Bit Length | 8 Bit |
| Parity | None |
| Handshake | DTR/DSR |
| Receive Buffer | Large |
| Receive Error | Ignore |

Endurance test

The endurancetest prints continuously a test pattern. There are two possibilities to start this test:

1. **By diagnostic menu.** If the Endurancetest was started from diagnostic mode menu, the test can be aborted by pressing the LF-Button for more than 1 second.
2. **After power up or printer reset with the help of a short circuit plug.** Additionally the endurance test must be enable by memory switch (see page 98). If the short circuit plug started the Endurancetest, the test can be aborted by removing this plug.

| <i>Interface</i> | <i>Description</i> |
|------------------|---|
| USB | The pins 1 and 4 (5V and GND) of the plug have to be shortened. |
| RS232 | The pins 6 and 20 (DSR and DTR) of the plug have to be shortened. |

There are two modes available in which the Endurancetest is working.

- a. If the linefeed button is pressed while the printer is switched on, the endurance test is executed in endless mode. **In this mode, test tickets will be printed until the power is switched off.**
- b. If the linefeed button is not pressed while switching on the printer, the endurance test prints a predefined number of tickets. **In limited mode printing stops after a determined count of tickets.** The number of tickets can be defined by the command GS (E(fn = 5) (see page 94). After printing the predefined number of tickets a self test printout is executed).

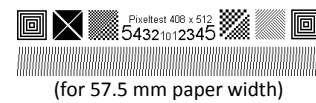
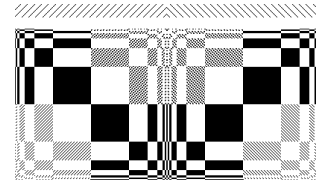
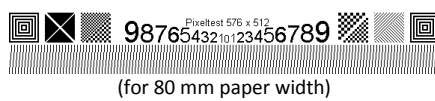
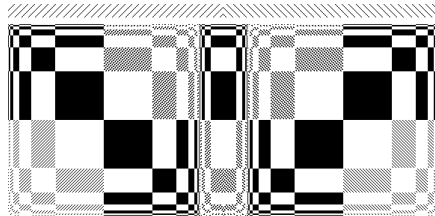
Note: In case of paper end or cover open the printer performs a automatic reset. Except if the endurance test starts by short circuit plug, the printer will continue if cover closed again or new paper is inserted.

When starting the Endurancetest by USB plug, the test is executed always in limited mode. But if the linefeed button is pressed while switching on or resetting the printer, the Endurancetest is executed in endless mode.

Endurance test Printout

The width of the graphics depends on the setting of the paper width. The number of tickets is divided into two kinds. The first Ticket is a ticket with graphics (see below) and the following nine tickets are without graphics.

The endurance test prints the following graphics:

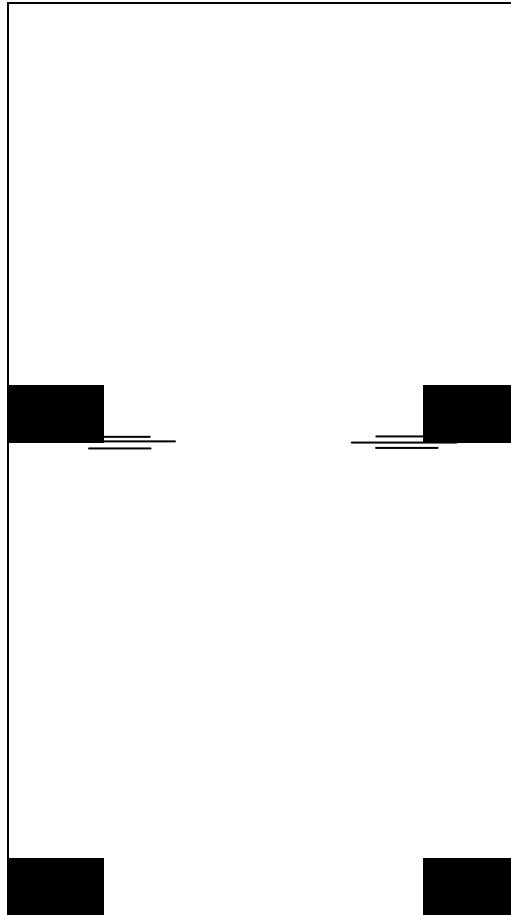


After printing a ticket, two status lines are printed and the printer performs a partial paper cut. Then the printout starts again. The status lines at the end of the ticket gives information's about total number of printed tickets, information whether black mark function is active or not, the expired time the endurance test is running and the serial number of the printer.

Black Mark test

The printer moves the paper to the next black mark, prints three lines, moves the paper until the next black mark is underneath the cutter (one Form Feed) and cuts the paper. After this operation, the paper is moved backwards to the first print position (top of form).

This test is repeated continuously and can be stopped by pushing the Linefeed button once.



Description of EERPOM Updates

After switching on the printer the statistic counters, which are stored in the EEPROM, were copied into the RAM.

Up from that point the statistic counters are accumulated inside of the RAM.

This means, actual statistic counters, which are stored in the RAM and EEPROM statistic counters are different!

The first time after switching on the printer, the statistic data are saved after 7,5 minutes. After this the statistic data are saved into the EEPROM every 15 minutes.

Due to this procedure, with every power off the statistical data of the last 15minutes could be lost.

Specialties

Switching On the Printer

After the power on procedure , the statistical data were updated once to increase the Power on count.

EEPROM Updates while Self Test Printing

If the self-test is started while switching on the printer, the update of the Power on counter happens during the self test is printed.

This means, that during this update of the statistical data, parts of the self test printout were added to the statistic data.

Example of Loosing Statistical Data

If statistic data are readout by a command or printed with the self-test printout always the actual counters – which are accumulated in the RAM - are transmitted or printed.

Due to the update of the EEPROM every 15 minutes, the following situation could happen:

- Assume the current line feed counter is 10.000 lines
- Switch on the printer, feed 100 lines, readout line feed counter which is now **10.100 lines** (Accumulated data in the RAM. The line feed counter in the EEPROM is still 10.000)
- Switch off the printer within 7,5 minutes
- Switch on the printer again
- Readout line feed counter which is still **10.000 lines** because the last 100 lines were printed within the last 7,5 minutes before switching off

Calculating Power On Time

The Power on time is calculated by subtracting the Power on counter from the EEPROM update counter and dividing afterwards by 4. This calculation of the Power on time is correct, because the EEPROM update counter is increased and saved every 15 minutes.

In special situations the EEPROM is updated additionally and then the Power on count is increased. This occurs every time when the Revision level counter was changed.

Due to this procedure, the Power on counter could be increased before the 15 minute period was passed. This means that with every change of the revision counter the calculated Power on time could have an error of maximum 15 minutes.

This is not significant, because the Revision level counter is not changed very often and then only by service personnel.

Technical Specifications

| | | |
|--------------------|-----------------------------------|--|
| Printmodule | Method | Thermal |
| | Print Resolution (horizontal) | 203 dpi (8 Dots/mm) |
| | Positioning Resolution (vertical) | 203 dpi (8 Dots/mm) |
| | Print Speed | up to 220 mm/s |
| | Print Speed TH230+ Draft | up to 300 mm/s |
| | Print Speed Color | up to 110 mm/s (with 2 color paper) |
| | Print Width | With 80 mm Paper: 72 mm = 576 dot With 57.5 mm Paper: 51 mm = 408 dot |
| | Top Margin | 5 mm incl. Reverse Feeding; 17 mm without Reverse Feeding |
| | Temperature Sensor | Thermistor |
| Cutter | Method | Guillotine |
| | Function | Full Cut or Partial Cut |
| | Cutting Speed | 300 ms |
| | Drive | Stepper Motor |
| Sensors | Paper Near End (adjustable) | Optical Slot |
| | Paper End | Optical Slot |
| | Black Mark | Reflective Optical Sensor; Optional as snap in. Backside or frontside, left or right |
| | Cover Open | Mechanical Micro Switch |
| | Cutter Home Sensor | Optical Slot |
| Drive | Paper Feed | Stepper Motor |

| | | |
|-------------------------------|-----------------------------------|--|
| Printing Specification | Character Sets (fixed) | PC437 (USA, Standard Europe) PC850 (Multilingual) PC852 PC860 (Portuguese) PC863 (Canadian-French) PC865 (Nordic) PC858 (Euro) PC866 (Cyrillic #2) PC1252 PC862 PC737 (Greek) PC874 (Thai) PC857 (Turkish) WPC1254 (Turkish) WPC1250 (Central Europe) WPC28591 (Latin 1) WPC28592 (Latin 2) WPC28599 (Turkish) WPC28605 (Latin 9) PC864 (Arabic) PC720 (Arabic) WPC1256 (Arabic) WPC28596 (Arabic) KATAKANA (Asia) PC775 (Baltic) WPC1257 (Baltic) WPC28594 (Baltic) |
| | Character Matrix WxH | Font A:13 * 24 Dots Font B:10 * 24 Dots |
| | Board Dimension | 124 mm * 110 mm |
| Electronic | TH230+ and iPRINT Microcontroller | ARM7 - ATMEL AT91SAM7SE |
| | TH230 Microcontroller | ARM7 - ATMEL AT91M55800 |
| | FLASH Memory | 16 MBit (1M * 16) - 3.3V |
| | RAM | 4 MBit (256K * 16) - 3.3V |
| | Serial EEPROM | 128x16 Bit - 3.3V |
| | Operator Panel | Power Button Linefeed Button Power LED (green) Paper End LED (yellow) Error LED (red) |
| | | |

| | | | |
|-----------------------|-------------------|------------------------------|---|
| | Interface Boards | | 1.) 25 pin RS232, 6 pin RJ12 CDKO, 3 pin Hosiden Power Plug, 9 pin Customer Display 2.) 25 pin RS232, 6 pin RJ12 CDKO, 3 pin Hosiden Power Plug 3.) USB 2.0 Compliant (Full Speed), 6 pin RJ12 CDKO, 3 pin Hosiden Power Plug 4.) Powered USB 2.0 Compliant (Full Speed), 6 pin RJ12 KLA 5.) MF On Board Interface: 25 pin RS232, 6 pin RJ12 CDKO, 3 pin Hosiden Power Plug, 9 pin Customer Display, PS2 (edgeways), MF-LED 2-color red/green (edgeways) - internal: MMC, MF-Memory Module 6.) MF Ready Interface 7.) LAN 10BaseT, 6 pin RJ12 CDKO, 3 pin Hosiden Power Plug, 9 pin Customer Display 8.) USB 2.0 Compliant (Full Speed), 25 pin RS232, 6 pin RJ12 CDKO, 3 pin Hosiden Power Plug |
| | Emulation | | Compatible to TH210 + 2 color printing functions |
| | Input Voltage | | 24 V +/- 10 % |
| | Power Consumption | | adjustable 48 W to 110 W or automatic detection for WN-Powersupplies |
| | TH230+ | Ready Mode Current / Power | ca. 78 mA / 1,9 W (including USB interface board – this value may change with other interface) |
| | | Sleep Mode 1 Current / Power | ca. 40 mA / 1,0 W (including USB interface board – this value may change with other interface) |
| | | Sleep Mode 0 Current / Power | ca. 12 mA / 0,29 W (including USB interface board – this value may change with other interface) |
| | TH230 | Ready Mode Current / Power | ca. 100 mA / 2,4 W (including USB interface board – this value may change with other interface) |
| | | Sleep Mode 1 Current / Power | ca. 65 mA / 1,6 W (including USB interface board – this value may change with other interface) |
| | | Sleep Mode 0 Current / Power | ca. 46 mA / 1,1 W (including USB interface board – this value may change with other interface) |
| Mechanic Specs | Dimensions WxHxD | | Width: 145mm Height: 148mm Depth: 195mm |
| | Weight | | ca. 2 Kg (depends from interface board) |

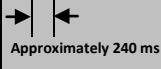
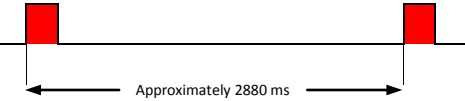
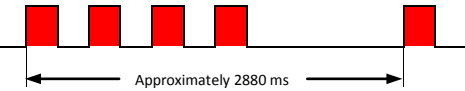
| | | |
|--|--|---|
| Special Features | Statistical Data | Yes |
| | Self test and Diagnostic Functions | Yes |
| | Paper Loading - Clamshell, Easy Drop | yes |
| | Paper Reverse Feeding | yes possible to full cut with automatic reverse feeding by command GS V (see page 155) |
| Operating/ Environmental Conditions - Approvals | <p>Climatic Requirements (IEC 721)</p> <p>Operating: 3/3 Class 3K3</p> <p>Non-operating: 3/1 Class 1K2</p> <p>Transport: 3/2 Class 2K2</p> | <p>Operation conditions:</p> <p>IEC 721 3/3 class 3k3 according to EN 60721-3-3</p> <p>Climatic tests according to IEC 68 / EN60068</p> <p>Air temperature 5°C - 45°C</p> <p>Humidity 5%r.h. (1g/m3) – 85%r.h. (25g/m3)</p> <p>Temperature change 0.5 K/min (max. 7.5K/30min)</p> <p>Air pressure 70kPa – 106kPa</p> <p>(70kPa is equivalent to an installation altitude of approx. 3000m above mean sea level)</p> <p>The operator should avoid locations exposed to long periods in direct sunlight.</p> <p>Storage conditions</p> <p>IEC 721 3/1 class 1k2 according to EN 60721-3-1</p> <p>Air temperature 5°C - 40°C</p> <p>Humidity 5%r.h. (1g/m3) – 85%r.h. (25g/m3)</p> <p>Temperature change 0.5 K/min</p> <p>Transport conditions</p> <p>IEC 721 3/2 class 2k2 according to EN 60721-3-2</p> <p>Climatic tests according to IEC 68 / EN60068</p> <p>Air temperature -25°C - 60°C (enhanced test condition for lottery up to +70°C)</p> <p>Humidity 15%r.h. (1g/m3) – 98%r.h. (32g/m3)</p> <p>Temperature change -25°C / 25°C</p> |

| | | |
|--|--|---|
| | Mechanical Requirements (EC 721) Operating: 3/3 Class 3M2 Non Operating: 3/1 Class 3M2 Transport: 3/2 Class 3M2 | Mechanic test conditions: Environmental classes/conditions : Stationary operation, weather protected DIN EN 60721-3-3 Class 3M3 printer on, printing attempts/printouts during test Transport conditions DIN EN 60721-3-2, Class 2M2 printer off Remark: The stress according to environmental class 3M1 (storage) is contained in environmental class 3M2 (transport). Test parameters: Sine Vibration 2-9 Hz-amplitude 1.5mm9-200 Hz-acceleration 5m/s ² 1 Oct./min., duration: 30 min 2-9 Hz-amplitude 3.5mm9-200 Hz-acceleration 10m/s ² 1 Oct./min., duration: 30 min Test parameters: Random Vibration Acceleration spectral density (ASD):10 to 30 Hz: Rise + 6 dB/Oct. 30 to 200 Hz: Constant PSD 1m ² /s ² 200 to 500 Hz: - 12 dB/Oct. duration: 30 min each axis Test parameters: Half-sine Shock acceleration: 40 m/s ² ; type LShock duration: 22 ms;50 shocks, each axis and orientation Shock acceleration: 100 m/s ² ; type IShock duration: 11 ms;100 shocks, each axis and orientation |
| | Conducted / Radiated Emission | EN 55022 class B |
| | Electrostatic Discharge | EN61000-4-2 level 4 (current discharge 8kV, air discharge 15 kV) |
| | Radiated susceptibility | EN 61000-4-3 and EN61000-4-6 with 10V/m |
| | Fast transient | EN 610000-4-4 |
| | Approvals | UL, cUL, FCC Class A, EN 60950, CE symbol class B |

ERROR Blink Pattern


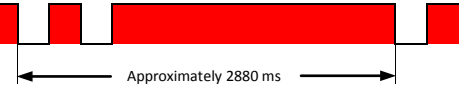

Recoverable Errors

The following table shows the blink pattern of all errors, which could be recovered by DLE ENQ 2 or by opening and closing the cover. These patterns are called “positive” blink patterns because the user has to count how many times the Error LED (**red**) is switched on.

| Error | Description | Blink Count | ERROR LED Blinking Pattern |
|----------------------------|--|-------------|--|
| | | |  |
| Cutter error | The automatic cutter doesn't work because it does not leave the home position or does not reach the home position. | 1 |  |
| Black Mark detecting error | The printer doesn't find the Black Mark. | 4 |  |


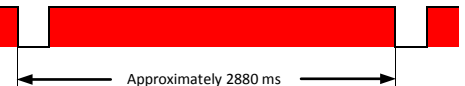
Automatic Recoverable Errors

The following table shows the blink pattern of all errors, which recover automatically. These patterns are called “negative” blink patterns because the user has to count how many times the Error LED (**red**) is switched off.

| Error | Description | Blink Count | ERROR LED Blinking Pattern |
|--------------------|---------------------------------------|-------------|--|
| | | |  |
| Low voltage error | The supply voltage is extremely low. | 2 |  |
| High voltage error | The supply voltage is extremely high. | 3 |  |


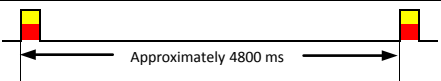
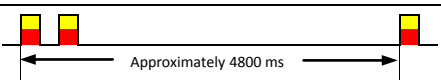
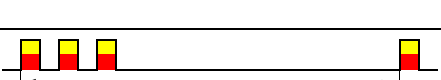
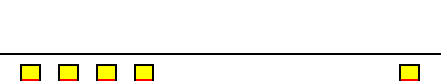
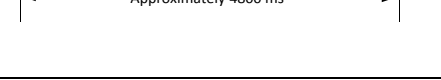
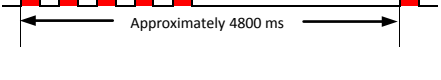




Unrecoverable Errors

The following table shows the blink pattern of all errors, which could not be recovered by DLE ENQ 2. These patterns are “negative” blink patterns too (see description above).

| Error | Description | Blink Count | ERROR LED Blinking Pattern |
|------------------|--|-------------|--|
| | | |  |
| Thermistor error | There is an abnormality in the print line temperature. | 1 |  |

Power-Up-Test Errors

After power-on of the printer, several self tests are executed, before starting the printer firmware itself:

| Error | Description | Blink Count | Yellow/Red LED Blinking Pattern |
|--|---|-------------|--|
| | | |  Approximately 240 ms |
| None valid Loader module found | There is none valid Loader (SST) module existing in the Flash memory → Printer stops | - | All three LEDs are permanently on. |
| MCU error | MCU hardware error found → Printer stops | 1 |  Approximately 4800 ms |
| IRAM error | Internal RAM hardware error found → Printer stops | 2 |  Approximately 4800 ms |
| RAM error | External RAM hardware error found → Printer stops | 3 |  Approximately 4800 ms |
| Timer/Counter error | Timer/Counter hardware error found → Printer stops | 4 |  Approximately 4800 ms |
| USART error | USART hardware error found → Printer stops | 5 |  Approximately 4800 ms |
| ADC/DAC error | ADC/DAC hardware error found → Printer stops | 6 |  Approximately 4800 ms |
| SPI error | SPI hardware error found → Printer stops | 7 |  Approximately 4800 ms |
| Interface card error | None valid interface card found → Printer stops | - |  Approximately 4800 ms |
| None valid Firmware or Codepage module found | There is none valid Firmware (FRM) or Codepage (FNT) module existing in the Flash memory → two blink series, then Upgrade mode | 2 |  Approximately 4800 ms |
| None valid Power-Up-Test module found | There is none valid Power-Up-Test (PUT) module existing in the Flash memory → two blink series, then go on | 3 |  Approximately 4800 ms |

